# LHA/LHD
# NATOPS MANUAL

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Approved

JOHN S. LEMMON
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By direction of
Commander, Naval Air Systems Command

# RECORD OF CHANGES

| Date of Update | Remarks/Purpose and Affected Chapter/Section |
|---|---|
| 16 July 2021 | • Paragraphs – 3.3.3, 6.1.1, 6.2.5, 6.3.2, 6.5.2, 6.5.2.1, 6.5.2.2, 6.5.9.1, 9.10.1, 9.11.1, A.4, A.4.1<br>• Figures – A-57 thru A-94<br>• Revision<br>• Parent AIRS NATOPS-2021-208 |
| 30 July 2020 | • Paragraphs – 1.1, 1.2, 1.6, 1.7, 1.8, 3.3.1.1, 4.5, 4.6.2, 6.3.1.1.1, 7.8.1.4, 8.2.7, 9.10.3, 9.10.5.1, 10.1.5, 11.2.7.1, 11.3.4.2, A.1, A.4, A.4.1, F.1, H.3.2.10<br>• Figures – 5–2, 6–12 thru 6–16, 7–6 thru 7–9, 11–2, A-1, A-3 thru A-36, A-57, A-63 thru A-86, E-1, F-1<br>• Parent AIRS NATOPS-2020–242 |
| 15 June 2019 | New post NATOPS Review Revision resulting from the April 2019 NATOPS review.<br>Contains changes/updates to the following:<br>Glossary, LOAA, Preface; Chapters 1, 3 thru 8, new separate Chapter 9 for Aircraft Handling Procedures, new separate Chapter 10 for Weapons Handling Procedures; Appendices A, E, I and J.<br>Parent AIRS NATOPS-2019-256. |
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# LHA/LHD

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# GLOSSARY

## A

**advisory control.** A form of air traffic control in which the controlling agency monitors radar and radio contact with aircraft under its control and provides traffic advisories. Traffic separation is the responsibility of the individual pilot, with the assistance provided by the control agency.

**aided aircraft.** An aircraft whose pilot(s) are using night vision devices.

**airborne stores.** Items intended for carriage internally or externally by aircraft, including racks, launchers, adapters, and detachable pylons, that are not normally separated from the aircraft in flight, such as tanks, pods, guns, nonexpendable training weapons, and targets.

**airborne weapons.** Items intended for carriage internally or externally by aircraft, that are normally separated from the aircraft in flight, such as missiles, rockets, bombs, mines, torpedoes, pyrotechnics, and ammunition.

**air capable ship.** All ships other than CV/CVN or LHA/LHD from which aircraft can take off, be recovered, or routinely receive and transfer logistic support.

**Airplane Mode (APLN).** V-22 flight configuration defined as nacelles set at 0°. Typical airspeeds 150 to 250 kts. Comparable to a turboprop aircraft.

**air taxi.** Jetborne or hovering flight at very low speed between two points.

**Amphibious Air Traffic Control Center (AATCC).** The centralized air traffic control agency for LHA/LHD responsible for maintaining the status and operational control of aircraft departing the ship and recovery of inbound aircraft after a mission is completed. AATCC is responsible for providing IMC approach and departure control services. Also, AATCC is responsible for maintaining the status and tactical control of airborne helicopters in support of amphibious assaults as directed by Tactical Air Control Center (TACC) Helicopter Coordination Section (HCS).

**amphibious assault aviation ship.** An LHA or LHD.

**Amphibious Task Force Commander (CATF).** The Navy officer designated in the initiating directive as commander of an amphibious task force.

**angels.** Altitude in thousands of feet.

**approach control.** A control station in AATCC responsible for controlling air traffic within the control area except that controlled by final, departure, or marshal control. It also is responsible for providing positive control for all CCA waveoff traffic until a radar handoff to another control station has been accomplished.

**arming.** An operation in which a weapon is changed from a safe condition to a state of readiness for initiation.

**arming area.** That area where ordnance is changed from a safe condition to a state of readiness. All arming evolutions required to be accomplished in the arming area by the aircraft stores loading manual/checklist shall be performed in this area. Before arming commences and prior to aircraft launch, the area in front/behind and/or surrounding the aircraft shall remain clear.

**aviation ordnance evolution.** A shipboard ordnance evolution requiring the breakout, buildup, and staging of ordnance and the loading, arming, launching, recovering, and dearming of ordnance-carrying aircraft.

**aviation ship.** A CV or CVN.

## B

**ball.** A pilot report indicating that the visual landing aid is in sight.

**Base Recovery Course (BRC).** The ship's magnetic heading during flight operations.

**bent.** A term used to identify when a radar or NAVAID is down/out of service.

**bingo.** An order to proceed and land at the field specified, utilizing a bingo profile. Aircraft is considered to be in an emergency/fuel critical situation. Bearing, distance, and destination shall be provided.

**braking stop.** The most aft position of the nozzle control lever, which gives a component of reverse thrust on fixed-wing aircraft.

**bullseye.** [ADMIN] A term used in pilot/controller communications to refer to the AN/SPN-41B.
[TACTICAL] An established reference point from which the position of an object can be referenced by bearing (magnetic) and range (nm) from this point.

**buster.** An order used by a ship controller to direct an aircraft to proceed at maximum safe speed.

## C

**captive ordnance.** Practice, inert ordnance that is intended to be retained on the aircraft throughout the flight.

**Carrier Controlled Approach (CCA).** An approach, executed by an aircraft, under the direction of the AATCC final controller transmitting azimuth and glidepath instructions to the pilot by radio.

**center.** A collective radio call for AATCC prefixed by a ship's code name that is used in the same manner as the shore-based counterpart.

**charlie.** A signal for aircraft to land aboard the ship. A number suffix indicates time delay in minutes before landing may be anticipated.

**clara.** A pilot transmission meaning the pilot does NOT have the visual landing aid (meatball) in sight.

**clean.** Aircraft configuration when the landing gear and flaps are retracted (up and locked).

**clean up.** An order for an aircraft to transition from a landing configuration "dirty" to the clean configuration.

**control area.** A circular airspace with a radius of 50 nm around the ship that extends upward from the surface to unlimited altitude and is under the cognizance of AATCC/TACC.

**control zone.** The airspace within a circular limit is defined by 5 nm horizontal radius from the ship, extending upward from the surface to and including 2,500 feet unless otherwise designated for special operations, and is under the cognizance of the Air Officer during VMC.

**Conversion Mode (CONV).** V-22 flight configuration defined as nacelles set between 84–1°. Typical speeds are 80 to 120 kts, comparable to a helicopter in forward flight.

**corrected hover weight.** The thrust being used for takeoff or landing corrected for pressure, altitude, temperature, and individual engine characteristics of fixed-wing aircraft.

**Coupled Instrument Approach (JPALS).** A term used in pilot/controller communications to indicate the aircraft flight control systems is engaged during final approach whereas the aircraft is conducting a hands-off approach to certified weather minimums.

**crutched.** Refers to any helicopter in a folded configuration with blade clamps and support poles installed.

**cutback.** Sudden and rapid reduction of engine speed as a result of JPT datum shift or dearming water switch during wet operations with fixed-wing aircraft.

## D

**datum.** Two green datum bars associated with the V/STOL Optical Landing System to help define glideslope.

**dearming (safing).** An operation in which a weapon is changed from a state of readiness for initiation to a safe condition.

**dearming area.** That area where ordnance is changed from a state of readiness to a safe condition. All dearming evolutions are to be conducted in the dearming area by the individual stores loading manual/checklist. The area ahead/behind and/or surrounding the aircraft shall be kept clear until all weapons/ordnance are completely safe. When taxiing aircraft from the landing area to the dearming area, care must be taken to minimize exposure of the armed ordnance to personnel and equipment.

**delta.** A signal given to hold and conserve fuel at an altitude and position appropriate to type aircraft and case recovery in effect. Also a pattern around the ship used to hold aircraft pending further clearance, assignment, etc.

**density altitude.** Pressure altitude in feet corrected for temperature and relative humidity. The higher the ambient air temperature/relative humidity, the higher the density altitude, resulting in a decrease in aircraft performance.

**departure control.** A control station in AATCC that is responsible for the orderly flow of departing traffic.

**dirty.** An aircraft configuration for landing where gear is down, flaps are set, and speed reduced (down and locked).

**dirty up.** An order for an aircraft to transition from a "clean" configuration to the landing configuration "dirty."

**divert.** An order for an aircraft to proceed and land at the field specified. This is a nonemergency situation.

**downloading.** An operation that removes airborne weapons/stores from an aircraft.

## E

**Emergency Expected Approach Time (EEAT).** The future time, assigned prior to launch, at which an aircraft is cleared to depart inbound or penetrate from a preassigned fix under lost communications conditions.

**Emergency Final Bearing (EFB).** A magnetic heading provided by AATCC to all flightcrews prior to launch to be used when executing emergency procedures for communications failure in IMC. The emergency marshal pattern shall be relative to the EFB and is the final bearing for the lost communications tacan approach.

**emergency marshal.** A marshal established by AATCC and assigned to each aircraft prior to launch. The emergency marshal consists of a bearing, range, altitude, and emergency expected approach time.

**Emission Control (EMCON).** Control of all electromagnetic radiations, including electronic communications, radar, and visual systems. During its imposition, no electronic emitting device within the designated bands shall be operated unless absolutely essential to the mission of the force.

**Expected Approach Time (EAT).** The future time at which an aircraft is cleared to depart inbound from a prearranged fix. Aircraft shall depart and commence approach at assigned time if no further instructions are received.

## F

**father.** Ship's TACAN

**feet dry.** Pilot to AATCC report indicating aircraft is passing over shore line proceeding over land.

**feet wet.** Pilot to AATCC report indicating aircraft is passing shore line proceeding over water.

**final bearing.** The magnetic bearing assigned by AATCC for final approach. It is an extension of the landing area centerline.

**final control.** A control station in AATCC responsible for controlling traffic in instrument meteorological conditions until pilot reports "VMC" or "meatball" or reaches approach minimums.

**fixed wing.** An aircraft, other than a helicopter, whose characteristics of flight enable vertical and short takeoffs and landings.

**Fleet Area Control and Surveillance Facility (FACSFAC).** A U.S. Navy fixed, shore-based air traffic control facility. Designated to manage offshore and inland operating areas and other assigned airspace, including special use airspace. Provides joint-use scheduling and control of surface, subsurface, and airborne military platforms operating within and transiting to and from these areas. Administers services to support the coexistence of military government and nongovernment agencies consistent with national priorities.

**flight level.** Altitude expressed in hundreds of feet determined by setting 29.92 in the aircraft pressure altimeter; that is, FL 230 equals 23,000 feet in relation to the standard atmospheric pressure of 29.92.

## G

**gadget.** All inclusive term for air search radar.

**ground resonance.** A condition of geometric imbalance on helicopters caused by offset dynamic forces when the helicopter makes improper contact with the deck. If allowed to continue, destruction of the helicopter is imminent. Improper tiedowns aggravate the onset of ground resonance.

## H

**HERO safe ordnance.** Any ordnance item that is sufficiently shielded or otherwise so protected that all EEDs/CADs contained by the item are immune to adverse effects (safety or reliability) when the item is employed in its expected shipboard RF environments, provided that the general HERO requirements are observed.

**HERO susceptible ordnance system.** Any ordnance system proven (by tests) to contain EEDs/CADs that can be adversely affected by RF energy to the point that the safety and/or reliability of the system is in jeopardy when the system is employed in expected shipboard RF environments.

**HERO unsafe ordnance.** Any ordnance item is defined as being HERO unsafe when its external wiring is physically exposed; when tests are being conducted on the item that result in additional electrical connections to the item; when EEDs/CADs having exposed wire leads are present, handled, or loaded; when the item is being assembled/disassembled; or when the item is in a disassembled condition. Ordnance items that fall into the above classification may be exempted from being classified as HERO unsafe ordnance as the result of HERO tests conducted to determine specific susceptibility.

**hover.** A condition of flight in which all movement relative to a fixed reference point has ceased.

**hover position indicator.** Vertical and horizontal light pattern mounted on the Island to provide a hover location cue for the pilot.

**hover stop.** The position of the nozzle lever that vectors the thrust to the vertical position (81°) on AV-8B aircraft.

**hung weapons.** Those weapons or stores on an aircraft that the pilot has attempted to drop or fire but could not because of a malfunction of the weapon, rack/launcher, or aircraft release control system.

## I

**inbound bearing.** The magnetic bearing assigned by AATCC to pilots descending directly to the ship. It may be, but is not necessarily, the BRC.

**inbound heading.** The magnetic heading assigned by AATCC that will ensure interception of the BRC at a specific distance from the ship.

**Initial.** A pilot report given to PriFly from an aircraft that is entering the break, 3 miles from the ship on the BRC.

**Instrument Carrier Landing System (ICLS) approach.** A precision approach which precise and continuous position error and range information from the AN/SPN-41 and TACAN is displayed in an aircraft enabling a manually-controlled precision approach to appropriate minimums.

**Instrument Meteorological Conditions (IMC).** Meteorological conditions expressed in terms of visibility, distance from cloud and ceiling, are less than the minimal specified for visual meteorological conditions.

## J

**jetborne flight.** Very slow speed flight supported by engine thrust only for fixed-wing aircraft.

**Joint Precision Approach and Landing System (JPALS).** The AN/USN-3 (V), also referred to as "Star Rider", is a GPS-based system using differential positioning which provides relative and precision navigation based on Global Navigation Satellite System technology. JPALS data is used in conjunction with the aircraft's own GPS measurements and attitude to compute a high integrity, precise, relative navigation vector to a hover or touch down point.

**JPALS Touchdown Point (TDP).** A specific point for landing on the ship provided by JPALS relative and precision navigation data.

**JPALS UHF Data Broadcast (UDB).** A one-way broadcast of JPALS data that will be used by JPALS-capable aircraft until the full two-way JPALS Data Link capability is integrated into the aircraft. The information provided will support on-deck alignment, relative navigation data required for F-35B/C to locate the ship (e.g., TACAN), and provide precision navigation data to support final approach. The JPALS UDB will not provide JPALS surveillance or precision surveillance data from JPALS-capable aircraft to the ship.

## K

**kilo report.** A pilot report indicating aircraft mission readiness.

## L

**Landing Force Commander (CLF).** The officer designated in the initiating directive to command the landing force.

**load report.** A report given to marshal by the COD/VOD aircraft providing the numbers of passengers, VIP codes, mail, and cargo on board: also, any pertinent information for the LHA/LHD, including fuel requirements and pilot name.

**loading (rearming).** An operation that installs airborne weapons and stores on or in an aircraft and may include fuzing of bombs and stray voltage checks.

**loading area.** That area in which replenishment of airborne weapons or stores and other armament items on or in an aircraft is conducted. When handling weapons in this area, all fuzes and initiators shall remain safe and all gun chambers clear.

## M

**manual instrument approach.** A term used in pilot/controller communications to indicate the pilot is manually using aircraft flight control systems to fly an approach to certified weather minimums.

**marshal.** A bearing, distance, and altitude fix designated by AATCC from which pilots shall orient holding and from which initial approach shall commence.

**marshal control.** A control station in AATCC that is responsible for the orderly flow of inbound traffic.

**meatball (or ball).** A pilot report indicating that the VLA is in sight, e.g., amber beam of stabilized glideslope indicator.

**Medical Evacuation (MEDEVAC).** Evacuation of dead, wounded, sick or otherwise incapacitated personnel by ship or air to an area or facility where appropriate medical aid can be obtained.

**mixed operations.** Simultaneous fixed-wing and helicopter air operations. Tiltrotor involvement with either type aircraft in the appropriate mode does not constitute mixed operations.

**monitor control.** The monitoring of radar and radio channels for emergency transmissions.

**mother.** Parent vessel (i.e., LHA/LHD).

## N

**nautical mile.** Defined as one minute of a degree of latitude, the length equals; 1,852 meters, 6,076.12 feet, 1.15078 statute mile. The derived unit of speed is the knot, one nautical mile per hour.

**needles.** The term used in pilot/controller communications to refer to the cockpit display of azimuth and elevation deviation signals from a precision approach landing system. It is referred to as a “fly to” display because the position indicators show the pilot where to fly the aircraft.

**Night Vision Device (NVD).** Any device (NVG, FLIR, low-light TC, etc.) that aids an individual’s vision at night.

**nonprecision approach.** Radar-controlled approach or an approach flown by reference to navigation aids in which glideslope information is not available.

**nonradar control.** A form of air traffic control in which the pilot flies according to a published procedure or as prescribed by the controlling agency. Traffic separation is provided by the controlling agency using frequent pilot position reports and modified separation criteria. This form of control is used in case of emergency, when all shipboard control radar is inoperative or, in the opinion of the AATCC officer, unsafe.

**NVD compatible.** Lighting systems which are only required for the unaided operator and shall have no adverse effect on the operator equipped with ANVIS devices. A system virtually invisible to the ANVIS devices.

**NVD compliant.** Components that are NVD compatible, NVD shipboard friendly, and incompatible systems which are dimmed, baffled or hidden from direct line of sight of the aided operator. A NVD compliant ship consisting of this lighting discipline can be used for aided and unaided operations so the ship’s mission is not compromised and the aided/unaided personnel can perform all duties, tasks and functions in a safe and efficient manner.

**NVD shipboard covert.** Only required to be seen by aided operators and cannot be detected by the unaided observer.

**NVD shipboard friendly.** Lighting systems which are required to be seen by both the aided and unaided operators simultaneously and/or independently. Has spectral energy emitted in a controlled fashion to allow direct aided view/recognition without impacting the devices to the point that critical visual cues are washed out or obscured.

## O

**operational necessity.** A mission associated with war or peacetime operations in which the consequences of an action justify accepting the risk of loss of aircraft and crew.

**ordnance handling.** The physical act of moving explosive devices manually or with powered equipment within the confines of the ship.

## P

**parrot.** Military IFF/transponder.

**Passenger/Mail/Cargo (PMC).** An administrative/logistics flight scheduled for transfer of personnel and/or material to/from the ship. PMC does not include lifts of combat troops for actual or training vertical assaults or withdrawals.

**pigeons.** Magnetic bearing and distance from an aircraft to a specific location.

**platform.** A reporting point 5,000 feet altitude in the approach pattern at which fixed-wing aircraft reduce the rate of descent so as to arrive at 1,200 feet, 12 DME, and 250 knots.

**pogo.** A term utilized by a controlling agency indicating return to last assigned frequency if no contact experienced on newly assigned frequency.

**popeye.** A pilot term used to indicate that the aircraft has entered IMC.

**Position and Intended Movement (PIM).** The reference position of the officer in tactical command at a given time, and a forecast of the course and speed expected to be made during future movement. Position and intended movement are established to assist the return of the aircraft, to aid outlying surface units (pickets, and so forth) in maintaining their stations and for rendezvous purposes.

**positive control.** A form of air traffic control in which the controlling agency has radar and radio contact with the aircraft being controlled and published approach and departure procedures are complied with, or where specific assignments regarding heading and altitude are issued by the controller. While altitude separation is provided by pilot maintaining assigned altitude, lateral and time separation is the responsibility of the air traffic controller. Speed changes may be directed by the air traffic controller.

**precision approach.** An approach in which azimuth and glideslope information are provided to the pilot.

**Precision Approach Landing System (PALS).** A family of systems used for all weather recovery of shipboard aircraft. It may include any or all of the following: AN/SPN-35, AN/SPN-41 ICLS, and AN/USN-3 JPALS.

**Primary Flight (PriFly) control.** The controlling agency that is responsible for aircraft traffic control within the control zone.

## R

**ramp time.** The time that the deck will be ready to recover aircraft and an aircraft is expected to arrive at the ramp.

**raspberry.** A ship-to-shore HF radio net, used for flight following and administrative traffic concerning aircraft.

**reaction controls.** Variable exhaust ports at the extremities of the AV-8B.

**ready deck time.** The time that the deck will be ready to recover aircraft.

**red light.** The local time at which a helicopter will no longer be SAR capable and has approximately 30 minutes of flight time remaining.

**rendezvous radial.** A prebriefed magnetic radial that is used to define a fixed wing rendezvous point. The rendezvous radial is temporary in nature and often applies only to a single flight of departing aircraft.

**retro report.** A report given to COD/VOD aircraft by marshal providing offload information on passengers, mail, cargo, or any other pertinent information.

## S

**safing (dearming).** An operation whereby a weapon is changed from the state of readiness for initiation to a safe condition.

**semi jetborne flight.** Flight where lift is provided by a combination of engine thrust and wing lift for fixed-wing aircraft.

**slash.** Starboard portions of the flight deck forward and aft of the island used for parking aircraft.

**source.** The amber ball associated with the V/STOL OLS to indicate glideslope in relation to the datums.

**spin.** A signal given to one or more fixed-wing aircraft indicating a departure and reentry into the break. The command "spin" may be issued by either the Air Officer, LSO, or flight leader.

**spin pattern.** A left-hand pattern employed for jet and turboprop aircraft to re-enter the break during Case I or Case II recoveries. The pattern will be flown at 1,200 feet oriented on the BRC or expected BRC.

**star rider.** JPALS (AN/USN-3(V)) precision landing system.

## T

**Tactical Air Control Center (TACC) (afloat).** When embarked, TACC is the primary air control agency for the Expeditionary Strike Group (ESG) and/or Amphibious Task Force (ATF), responsible for all air operations supporting the amphibious force. This control refers to all airborne operations not incidental to the actual launch or recovery of aircraft, instrument departure, approach and marshal.

**tactical direction.** A form of nonradar control in which tactical information is passed to an aircraft by the controlling unit, but the aircraft commander is responsible for navigation and safety.

**transition.** The maneuver of changing from nonconventional flight, wholly and partially jetborne, to conventional flight, or vice versa for fixed-wing aircraft.

**trimback.** Reduction of engine speed through JPTL action to hold constant JPTL at datum limit with fixed-wing aircraft.

## U

**unaided aircraft.** An aircraft whose pilots are not using night vision devices.

**uncoupled/uncoupling.** Aircraft disengaged/disengaging from automatic flight control capabilities associated with a JPALS approach.

**unexpended ordnance.** Airborne ordnance that has not been subjected to attempts to fire or drop, and is presumed to be in normal operating condition and can be fired or jettisoned if necessary.

## V

**Visual Meteorological Conditions (VMC).** Weather conditions in which VFR applies, expressed in terms of visibility, ceiling height, and aircraft clearance from clouds along the flightpath. When these criteria do not exist, IMC prevails and IFR must be complied with.

**V/STOL optical landing system.** Provides visual glideslope and trend information during the final portion of a Case III approach.

## W

**waveoff.** An action to abort a landing, initiated by primary flight control, the LSO, LSE, or at the pilot's discretion. The response to a waveoff signal is mandatory.

**weather criteria requirements.** Case I: Fixed wing weather ceiling to be no lower than 3,000 feet and not less than 5 nm visibility (1,000 foot ceiling and 3 nm visibility for helicopters).

Case II: Fixed wing weather ceiling to be no lower than 1,000 feet and not less than 5 nm visibility unless modified by the ship's commanding officer for special operations (500 foot ceiling and 1nm visibility absolute minimum Case II for helicopters).

Case III: V/STOL weather ceiling below 1,000 feet or visibility below 5 nm or ceiling and visibility below Case II minimums set by the ship's commanding officer for special operations (below 500 foot ceiling or less than 1 nm visibility for helicopters).

## Z

**ZIP LIP.** A condition that may be prescribed for flight operations during day or night VMC under which positive communications control is waived and radio transmissions are held to the minimum necessary for safety of flight.

# LIST OF ABBREVIATIONS AND ACRONYMS

## #

**3BSM.** Three bearing swivel module.

## A

**AATCC.** Amphibious air traffic control center.

**ACE.** Aviation combat element.

**AFFF.** Aqueous film forming foam.

**AIMD.** Aircraft intermediate maintenance department.

**ALBAR.** Adjustable length towbar.

**AMCM.** Airborne mine countermeasures.

**APLN.** V-22 airplane mode.

**APP.** Auxiliary power plant (H-53).

**APU.** Auxiliary power unit (H-60).

**ASTO.** Auto short takeoff.

**ATC.** Air traffic control.

## B

**BRC.** Base recovery course.

**BFWS.** Blade fold wing stow.

**BSTO.** Button short takeoff.

## C

**C5I.** Command, control, communications, computers, combat systems, and intelligence.

**CAI.** Close-in approach indicator.

**CATF.** Commander, amphibious task force.

**CCA.** Carrier controlled approach.

**CCO.** Combat cargo officer.

**c.g.** Center of gravity.

**CIC.** Combat information center.

**CLF.** Commander, landing force.

**COMSEC.** Communications security.

**CONV.** V-22 conversion mode.

**CQ/DLQ.** Carrier qualification/deck landing qualification.

**CR.** Change recommendation.

## D

**DAIR.** Direct Altitude and Identity Readout.

**DECU.** Digital electrical control unit.

**DR.** Dead reckoning.

## E

**EAT.** Expected approach time.

**ECU.** Electrical control unit.

**EEAT.** Emergency expected approach time.

**EED.** Electroexplosive device.

**EEFI.** Essential elements of friendly intelligence.

**EFB.** Emergency final bearing.

**EMCON.** Electronic emission control.

**ETA.** Estimated time of arrival.

**ETE.** Estimated time en route.

## F

**FACSFAC.** Fleet area control and surveillance facility.

**FAF.** Final approach fix.

**FCA.** Floor of controlled airspace.

**FCF.** Functional checkflight.

**FCLP.** Field carrier landing practice.

**FOD.** Foreign object damage.

**FRAG.** Fragmentary orders.

**FRCSW.** Fleet readiness center southwest.

## G

**GAIL.** Glide angle indicator light.

**GNSS.** Global navigation satellite system.

**GTS.** Gas turbine starter (fixed wing).

**GW.** Gross weight.

## H

**HERO.** Hazards of electromagnetic radiation to ordnance.

**HPI.** Hover position indicator.

**HRST.** Helicopter rope suspension training.

**HUD.** Heads-up display.

## I

**IMA.** Intermediate maintenance activity.

**IMC.** Instrument meteorological conditions.

## J

**JPALS.** Joint precision approach and landing system (AN/USN-3).

**JPT.** Jet pipe temperature (fixed wing).

**JPTL.** Jet pipe temperature limiter (fixed wing).

**JTD.** Joint Technical Data.

## L

**LOI.** Letter of instruction.

**LSE.** Landing signal enlisted.

**LSO.** Landing signal officer.

## M

**MagVar.** Magnetic Variation.

**MAR.** Marshal.

**MFFV.** Mobile firefighting vehicle.

**MIM.** Maintenance instruction manual.

## N

**NAVAID.** Navigational aid.

**NSI.** Night system instructor.

**NSTM.** Naval surface technical manual.

**NVD.** Night vision devices.

**NWS.** nosewheel steering.

## O

**OCE.** Officer conducting exercise.

**ODO.** Operations duty officer.

**OIC.** Officer in charge.

**OLS.** Optical landing system.

**OOD.** Officer of the deck.

**OPAREA.** Operational area.

**OTC.** Officer in tactical command.

## P

**PALS.** Precision approach landing system.

**PMC.** Pax/mail/cargo.

**POL.** Petroleum oil and lubrication.

**PriFly.** Primary flight control.

## R

**RADHAZ.** Radiation hazards.

**RELNAV.** Relative navigation.

**Rpm limit.** Fan speed limit (fixed wing).

**RVL.** Rolling vertical landing (fixed wing).

**RVSM.** Reduced vertical separation minimum.

**RVTO.** Rolling vertical takeoff (fixed wing).

## S

**SAAHS.** Stability augmentation attitude hold system.

**SAR.** Search and rescue.

**SAS.** Stability augmentation system.

**SGSI.** Stabilized glideslope indicator.

**SIGINT.** Signal intelligence.

**SPINS.** Special instructions.

**SRC.** Stores reliability card.

**SSTO.** Stick short takeoff.

**STO.** Short takeoff.

## T

**TACC.** Tactical air control center.

**TAO.** Tactical action officer.

**TCA.** Terminal control area.

**TOW.** Tail-over-water.

## U

**UDB.** UHF data broadcast.

## V

**VERTREP.** Vertical replenishment.

**VLA.** Visual landing aid.

**VMC.** Visual meteorological conditions.

**VSBIT.** Vehicle systems built-in test.

**V/STOL.** Vertical/short takeoff and landing.

**VTO.** Vertical takeoff.

**VTOL.** Vertical takeoff and landing.

## W

**WOD.** Wind over deck.

# PREFACE

## SCOPE

Naval Air Training and Operating Procedures Standardization (NATOPS) products have been developed to improve aviation safety and readiness throughout the Navy and Marine Corps. They are prepared under the authority of the Chief of Naval Operations and issued by Commander, Naval Air Systems Command to support naval aircraft flight operations. NATOPS Flight Manuals (NFMs) contain flight clearance information, operating procedures and restrictions necessary for flight crews to effectively operate their aircraft. General Series NATOPS Manuals (NMs) supplement T/M/S NFM products in the operating environments they address. NFMs and NMs provide the best available T/M/S aircraft information and operating instructions for most circumstances. However, no manual can address every situation completely or be a substitute for sound judgment. Operational situations may require modification of the procedures contained therein. As an aircrew or ground support member engaged in LHA/LHD operations, it is your responsibility to have a thorough knowledge of the contents.

## NATOPS PROGRAM INFORMATION

See Chapter 1 for (1) the NATOPS product set, and (2) LHA/LHD NATOPS program management assignments which include the NATOPS Model Manager Unit, the NATOPS Advisory Group members, and the NATOPS Cognizant Command. Chapter 1 also includes other pertinent NATOPS program information unique to this product.

## TYPES OF NATOPS PRODUCTS

Revisions to NATOPS products are produced either in paper form or in electronic (eNATOPS) form where every change to the product is released as a complete product identified by title, NAVAIR number and date. This NATOPS Manual is an eNATOPS (eNM) product.

## eNATOPS PRODUCTS

eProducts are a class of products that are intended to exist only in the electronic environment. This class of products can include derivatives such as ePCLs, eFCFCLs, etc. While the contents of eProducts remain the same as paper products, eProducts will appear slightly different, and their distribution process is also changed. There will be no changes, interim changes, errata, or pen-and-ink entries released. Changed text and illustrations within an eProduct will be identified by highlighting or change bars in the page margin.

NATOPS checklists, passenger information cards, etc. required in emergencies such as loss of power situations will remain available as paper-based products.

## DETERMINING THE CURRENT VERSION OF NATOPS PRODUCTS

Before using this product, ensure you have the latest version by verifying the date of publications in use match those available on the NAVAIR Airworthiness and CYBERSAFE website at https://airworthiness.navair.navy.mil or on the Naval Air Technical Data and Engineering Services Command (NATEC) website at https://mynatec.navair.navy.mil. See the Record of Changes page for a current listing of this NATOPS product set.

## KEEPING NATOPS PRODUCTS CURRENT

NATOPS products must be kept current through an active change program. Corrections, additions to, deletions from, and suggestions for improving contents should be submitted as NATOPS Change Recommendations (CRs) as soon as possible after discovery. CRs shall be worded as specifically as possible. CRs may be submitted by anyone in accordance with CNAF M-3710.7. All users are encouraged to contribute to the currency, accuracy, and usefulness of this and other NATOPS products by submitting timely CRs. Content standards for NATOPS products are found in MIL-DTL-85025B(AS), available at https://airworthiness.navair.navy.mil.

## THE NATOPS CR PROCESS

**Categories of CRs.** NATOPS CRs are submitted as URGENT, PRIORITY or ROUTINE. URGENT and PRIORITY CRs usually involve safety-of-flight matters that require resolution prior to the next scheduled update. Some PRIORITY change recommendations may be upgraded to URGENT by NAVAIR (AIR-4.0P), by the NAVAIR Program Class Desk or by the NATOPS Model Manager.

**Classifications of ROUTINE CRs.**ROUTINE category CRs are further classified as follows:

**Technical**— Typically those CRs which affect systems description and/or limitations which must be confirmed/evaluated by engineers. Approved Technical CRs are bundled and issued as part of the next NATOPS update. CRs are also the fleet entry point for NATOPS technical information and/or assistance requests.

**Operational**— CRs which affect the operation of aircraft/systems. These typically involve changes in procedures. Approved operational CRs are incorporated via the next update, unless otherwise directed by the NATOPS PM.

**Administrative**— CRs which correct obvious errors requiring no further review (duplications, grammar, numbering, etc.). Approved Administrative CRs are incorporated via the next NATOPS update.

**Submitting NATOPS CRs.** The preferred means of submitting NATOPS CRs is through the Airworthiness Issues Resolution System (AIRS). AIRS may be accessed at https://airworthiness.navair.navy.mil. AIRS is the fastest and most efficient means of processing and resolving NATOPS CRs. In the event that a connection to AIRS is not available, URGENT and PRIORITY CRs may be submitted via Naval message in accordance with CNAF M-3710.7.

## UPDATES TO NATOPS PRODUCTS

NATOPS publications are reviewed, and updates issued, at regular intervals as determined by the NATOPS Program Manager. CRs are held and compiled into a regularly scheduled update. This ensures that CRs do not languish, and are incorporated in a timely manner. Updates are announced via Naval messages. Updates are delivered in the form of revisions; for paper publications/products, this may involve making pen-and-ink entries and/or replacing pages. Update messages and update contents are posted on the Airworthiness and CYBERSAFE website at https://airworthiness.navair.navy.mil and on the NATEC website at https://mynatec.navair.navy.mil.

## OBTAINING PAPER COPIES OF NATOPS PRODUCTS

**One-Time Orders.** Paper copies of eProduct NATOPS updates are not available through the naval supply system, but may be ordered in limited quantities through the NATEC print-on-demand system by contacting the FRCSW Logistics Element Manager with appropriate justification at DSN 735-2425 or CML (619) 545-2425. Copies of paper products may be ordered from the Naval Logistics Library (NLL) at https://nll.navsup.navy.mil, or through the naval supply system. They are also available in PDF format on the NAVAIR Airworthiness and CYBERSAFE website at https://airworthiness.navair.navy.mil or on the NATEC website at https://mynatec.navair.navy.mil.

**Note**

- When the current revision of a paper product is ordered through NLL, all active paper updates are shipped with the active revision.
- Quantities of a paper product ordered in excess of the maximum order quantity posted on the NLL website will not be shipped. If additional quantities are required, contact the FRCSW logistics element manager (LEM) at NATEC tels DSN 735-2425 or CML (619) 545-2425 for assistance.

**Distribution.** Upon request by the NATOPS Program Manager, NATEC sends printed copies of entire publications or updates to users whose NATOPS product requirements are maintained within its Automatic Distribution Requirements List (ADRL) database. NATEC also maintains an e-mail address list for each product in its ADRL database and automatically sends notices of all new paper and updated products to listed units. Detailed procedures for establishing and maintaining an ADRL account are contained in NAVAIR technical manual 00-25-100 work package (WP) 007-00, available at https://mynatec.navair.navy.mil. When an ADRL account has not been updated within the last 12 months, all automatic distribution for the account will be suspended until it is updated.

**Note**

To avoid cost and delivery inefficiencies that result from excessive or insufficient distributions, NATOPS Program Managers are authorized to adjust automatic distribution quantities of NATOPS products. Units should confirm their requirements with the NATOPS Program Manager in advance of distribution to ensure they receive sufficient quantities.

## CHANGE SYMBOLS

Revised text in a paper product is indicated by a black vertical line in the margin of the page, like the one adjacent to this paragraph or by highlighting the affected content. Change symbols in the margin by the chapter number and title indicate a new or completely revised chapter.

## SPECIAL TERMINOLOGY IN NATOPS PRODUCTS

The following special terminology applies to all NATOPS products:

**Warnings, Cautions, and Notes.** The following definitions apply to WARNINGS, CAUTIONS, and Notes:

**WARNING**

Explanatory information about an operating procedure, practice, or condition, etc., that may result in injury, death, or loss of aircraft if not carefully observed or followed.

**CAUTION**

Explanatory information about an operating procedure, practice, or condition, etc., that may result in damage to equipment if not carefully observed or followed.

**Note**

Explanatory information about an operating procedure, practice, or condition, etc., that must be emphasized.

**Requirement for compliance.**

“Shall” is used only when application of a procedure is mandatory.

“Should” is used only when application of a procedure is recommended.

“May” and “need not” are used only when application of a procedure is optional.

“Will” indicates futurity and never indicates any degree of requirement for application of a procedure.

**Requirement for landing aircraft.**

“Land Immediately” means execute a landing without delay.

“Land as Soon as Possible” means land at the first site at which a safe landing can be made.

“Land as Soon as Practicable” means extended flight is not recommended. The landing site and duration of flight are at the discretion of the pilot in command.

# CHAPTER 1

# Introduction

## 1.1 PURPOSE

This manual provides organizational relationships, responsibilities, requirements and procedures for aircraft and related support operations aboard LHA and LHD type ships.

## 1.2 SCOPE

The responsibilities, requirements and procedures contained in this manual apply to all persons involved in operating aircraft and supporting aircraft flight operations on LHA and LHD type ships.

This information encompasses a wide range of subjects which includes:

1. Aircraft deck and airborne flight operations, including pre-deployment planning, and preparing for flight operations.
   a. Launch and recovery of aircraft.
   b. Procedures for miscellaneous operations, including plane guard, Search and Rescue (SAR), and vertical replenishment (VERTREP).
2. Air Traffic Control (ATC) monitoring and control of airborne aircraft during Visual Flight Conditions (VMC) and Instrument Flight Conditions (IMC) launches, recoveries, airborne holding, and in the ship's operating areas.
3. Support operations aboard, encompassing:
   a. Movement and placement of aircraft on the flight deck, aircraft elevators, and hangar deck.
   b. Fueling, loading, maintenance, and security of aircraft.

## 1.3 FLIGHT CLEARANCES

Airworthiness is the property of an air system configuration that enables it to safely attain, sustain and terminate flight in accordance with the approved usage limits. CNAF M-3710.7 requires that, prior to each flight, each naval aircraft, manned or unmanned, shall be certified that it is airworthy. Airworthiness certifications are issued by NAVAIRSYSCOM in the form of flight clearances. Permanent flight clearances are issued for standard T/M/S aircraft configurations, missions, and capabilities in the form of NATOPS Flight Manual (NFM) products, Naval Aviation Technical Information Products (NATIP), designated Original Equipment Manufacturer (OEM) products, and General Series NATOPS Manuals (NM). Interim flight clearances are temporary clearances that are issued as stand-alone documents for non-standard aircraft configurations, missions, conditions, aircraft-related equipment and capabilities, or allow deviations from existing flight clearances for specific instances. All current flight clearances may be found on the NAVAIR Airworthiness and CYBERSAFE website, https://airworthiness.navair.navy.mil. NAVAIRSYSCOM (AIR-4.0P) is the final authority within the Navy and Marine Corps on airworthiness issues. NAVAIRINST 13034.1-series provides further guidance concerning flight clearances.

## 1.4 FLIGHT CLEARANCE PRODUCTS

Each NM contains aircraft flight clearance requirements, conditions and information that supplements those in T/M/S aircraft NFM product sets.

### 1.4.1 LHA/LHD NATOPS Product Set

This NM contains operating procedures and information applicable to one or more T/M/S aircraft. The LHA/LHD NATOPS product set is comprised of the following product:

| | |
|---|---|
| NAVAIR 00-80T-106 | LHA/LHD NATOPS Manual. |

## 1.5 LHA/LHD NATOPS PROGRAM MANAGEMENT ASSIGNMENTS

Units are designated to perform the duties and carry out LHA/LHD NATOPS Manual program management responsibilities in accordance with CNAF M-3710.7 as follows:

### 1.5.1 NATOPS Model Manager Unit

Naval Surface Force, U.S. Atlantic Fleet is designated as the NATOPS Model Manager Unit for the LHA/LHD Manual. Contact information for NAVSURFLANT is as follows:

| | |
|---|---|
| Message PLAD: | COMNAVSURFLANT NORFOLK VA//N42// |
| Address: | COMMANDER<br>COMNAVSURFLANT<br>ATTN: CODE N42 NATOPS PROGRAM MANAGER<br>1751 MORRIS ST BLDG D-29<br>NORFOLK VA 23551-2808 |
| Telephone: | CML: (757) 836-3188<br>DSN: 836-3188 |
| Email: | CNSL_N42_AVIATIO.fct@navy.mil |

### 1.5.2 NATOPS Advisory Group

NATOPS Advisory Group Member relationships, responsibilities and procedures are contained in CNAF M-3710.7. The following commands are designated as members of the NATOPS Advisory Group for the LHA/LHD NATOPS Manual:

| NATOPS Advisory Group Member | Representative's Code |
|---|---|
| Commandant of the Marine Corps | HQMC (SD) |
| Commander, Naval Air Forces | NAVAIRFOR (N455) |
| Commander, Naval Surface Forces | NAVSURFFOR (N42) |
| Commander, Naval Surface Force Atlantic | NAVSURFLANT (N426) |
| Commanding General, Marine Forces Command | MARFORCOM (DSS) |
| Commanding General, Marine Forces Pacific | MARFORPAC (SAFETY) |
| Commanding General, Fourth Marine Aircraft Wing | FOURTH MAW (DOSS) |
| Commander, Naval Air Systems Command | NAVAIRSYSCOM (AIR 4.0P/5.0F) |
| Commander, Naval Safety Center | NAVSAFECEN (Code 11) |

Although NAVSEASYSCOM is not member of the NATOPS Advisory Group, NAVSEA's response may be required on occasion. Since the NAVSEA responder's code will vary depending on the issue, the NAVAIR (AIR-4.1.5) Aviation/Ship Integration Office will assist in identifying the appropriate NAVSEA code and will work with the NAVSEA code for any required response.

### 1.5.3 NATOPS Cognizant Command

Naval Air Forces Command is designated as the Cognizant Command for the LHA/LHD NATOPS product set.

## 1.6 SHIP'S DUTIES AND RESPONSIBILITIES

The titles, duties and responsibilities of key personnel responsible for flight operations and the control, handling and support of aircraft in the vicinity of and onboard LHA and LHD type ships are contained in Chapter 2.

## 1.7 YOUR RESPONSIBILITIES

The role of the LHA/LHD is to operate aircraft in support of naval amphibious operations. Persons who operate aircraft or work on or venture onto the aircraft elevators, flight deck, and/or hangar deck aboard LHA and LHD type ships shall be familiar with the safety precautions and procedures contained within this manual. In addition, air department, Marine Air Wing, squadron, and ship's company personnel with responsibilities for the operation and support of aircraft should be thoroughly familiar with the detailed requirements and procedures pertinent to their own responsibilities contained within this manual and other relevant publications listed below.

## 1.8 OTHER RELEVANT PUBLICATIONS

Aircrew members should also be familiar with the following products which complement the LHA/LHD NATOPS manual:

| | |
|---|---|
| NAVAIR 00-80R-14 | NATOPS U.S. Navy Aircraft Firefighting and Rescue Manual (Afloat). Contains detailed requirements and procedures for rescue and firefighting personnel. |
| NAVAIR 00-80R-14-1 | NATOPS U.S. Navy Aircraft Emergency Rescue Information Manual (Afloat). Contains detailed information and procedures for individual T/M/S aircraft, onboard equipment and hazards for use by rescue, firefighting, and crash and salvage personnel. |
| NAVAIR 00-80R-19 | NATOPS U.S. Navy Aircraft Crash and Salvage Operations Manual (Afloat). Contains detailed information and procedures for the handling and disposition of aircraft that cannot be taxied, towed, or moved normally. |
| NAVAIR 00-80T-109 | NATOPS Aircraft Refueling Manual. Contains detailed information and procedures for handling of aviation fuels from delivery to LHA/LHD through dispensing into aircraft. |
| NAVAIR 00-80T-111 | V/STOL Shipboard and Landing Signals Officer NATOPS Manual. Contains detailed information and procedures on use of optical landing systems and related equipment aboard ship and the control of AV-8B aircraft by V/STOL LSOs. |
| NAVAIR 00-80T-111-1 | STOVL Shipboard and Landing Signals Officer NATOPS Manual. Contains detailed information and procedures on use of optical landing systems and related equipment aboard ship and the control of F-35B aircraft by STOVL LSOs. |
| NAVAIR 00-80T-112 | NATOPS Instrument Flight Manual. Contains detailed information on instrument flight requirements and procedures, including physiological effects such as disorientation. |
| NAVAIR 00-80T-113 | NATOPS Aircraft Signals Manual. Contains standard hand, wand, light, and beacon signals for control, communication and use among aircraft; tower (PriFly); aircraft launch, recovery and handling personnel; and ground support personnel. |
| NAVAIR 00-80T-115 | U.S. Marine Corps Expeditionary Airfields and Aircraft Recovery Operations NATOPS Manual. Describes planning, layout, systems and support equipment for Marine Corps Expeditionary Airfields (EAFs). Contains instructions and procedures for Marine Corp EAFs and MCAS aircraft recovery personnel engaged in EAF/aircraft recovery operations. |
| NAVAIR 00-80T-123 | Aircrew Systems NATOPS Manual. Contains detailed descriptions and procedures for use of aircrew clothing and equipment in various environments. |
| NAVAIR 00-80T-125 | Air Traffic Control Afloat NATOPS Manual. Contains information on administrative and operational procedures for all Navy units providing air traffic control services on all CVN and LHA/D type ships, and in TACC. |
| NAVAIR 17-1-537 | Aircraft Securing and Handling Procedures |

# CHAPTER 2

# Predeployment

## 2.1 COMMAND RELATIONSHIPS

### 2.1.1 Command Relationship Options for Amphibious Forces are Described in Joint Publication 3-02

This instruction outlines the possible command and control relationships for an amphibious force. These include OPCON, TACON, and supporting relationships. The rest of this section describes agreements that have been reached to clarify responsibilities.

### 2.1.2 Navy Aircraft Squadron Commander/Detachment OIC

The commanding officer or officer in chief of the Navy Helicopter Sea Combat (HSC) squadron/detachment shall report to the ship's commanding officer.

#### 2.1.2.1 Helicopter Detachment Personnel Attached to Amphibious Aviation Ships

Helicopter detachment personnel attached to amphibious aviation ships shall not be assigned additional collateral duties. The requirements of the helicopter to fly or to be immediately ready to fly around the clock puts the helicopter detachment personnel on a 24-hour call basis. The officer in charge (OIC) must have sufficient flexibility to schedule meals, work, rest, and training periods to meet this commitment. Similarly, liberty for detachment personnel should be controlled in accordance with the ship's policy by the detachment OIC, who is cognizant of the full workload of the detachment.

#### 2.1.2.2 Detachment Support

Berthing for helicopter detachments aboard amphibious aviation ships should be as follows:

1. Officers — Embarked pilots shall be assigned staterooms commensurate with their rank.
2. Chief petty officers — CPO quarters.
3. Enlisted personnel — Should be berthed in a common compartment.

The ship's administrative responsibility to the detachment includes officer and enlisted records, medical and dental records, pay records, and other administrative tasks essential to the function of the detachment.

### 2.1.3 Ship's Commanding Officer

U.S. Navy regulations set forth the authority of the ship's commanding officer with respect to the aircraft embarked in or operating from the ship. The commanding officer of the ship shall respect the identity and integrity of organizational embarked marine squadrons/detachments, and:

1. Shall have all orders given through the Marine chain of command insofar as practicable or as an emergency may dictate.
2. May require Marines, when in the commanding officer's opinion an emergency exists, to perform such duties as their special knowledge and skill enables them to perform.
3. Shall ensure that the aviation unit commander has knowledge of any degradation in aviation facilities, certification, or deficiencies in training and/or qualified flight quarter's personnel.

4. Shall ensure the squadron/detachment has adequate opportunity to remain current in day/night shipboard land/launch operations.
5. Shall provide heavy weather protection of aircraft, including:
   a. Hangar space, when possible.
   b. Compliance with applicable aircraft securing procedures as listed in NAVAIR 17-1-537, “Aircraft Handling and Securing Equipment.”
6. Shall provide Intermediate Maintenance Activity (IMA) support through the AIMD.

#### 2.1.3.1 Air Department Manning/Ship Support of Flight Operations

OPNAVINST C3501.104 (ROC/POE) delineates, “The ship can support 10 hours of flight operations per day when a Marine composite squadron or other aviation squadron of similar size is embarked.” When time for initial manning or final respot is factored in, the total time can easily exceed 12 hours of operations. Flight operations that are not in support of an ongoing operation or contingency shall adhere to the scheduled 10-hour continuous flight operations from first launch to last recovery.

**Note**

This 10-hour restriction is not intended to preclude short-duration, single-spot operations. The Air Officer will determine whether such operations are feasible on a case-by-case basis.

### 2.1.4 Embarked Aircraft Squadron/Commanding Officer/Detachment Officer In Charge

The Squadron Commanding Officer/Detachment Officer in charge retains ultimate responsibility for aircraft employment and safety of flight operations during all embarked phases of the operation, and may establish wind, pitch, and roll limitations more restrictive than those in Appendix A. This, however, shall not be construed as impairing the operational authority of the Commander, Landing Force (CLF), the Commander, Amphibious Task Force (CATF), or the ship’s commanding officer.

To ensure efficient operations, the following shall be provided to or coordinated with the ship:

1. Information regarding pilot qualifications and limitations.
2. Complete list by bureau number of aircraft being deployed. The list shall include all aircraft side numbers, SIF codes, and any peculiarities in configuration that will affect handling, ordnance loading, or mission capability.
3. Aircraft limitations.
4. Scheduling of aircraft, pilots, and crewmen.
5. Pilot briefings.
6. Maintenance status reporting.
7. Currency of pilot's day/night shipboard qualifications.
8. Applicable heavy weather protective measures as listed in aircraft technical manuals and NAVAIR 17-1-537, “Aircraft Handling and Securing Equipment.”
9. Establish as required more restrictive wind, pitch, and roll limitations than listed in Appendix A, and notify ship’s commanding officer of their implementation.

### 2.1.5 Augmentation Support by Embarked Units

#### 2.1.5.1 Intermediate Maintenance Activity

Augmentation shall be provided by the appropriate service organization in accordance with fleet directives.

#### 2.1.5.2 Integrity Watch

All embarked units and detachments shall provide personnel to stand the aircraft integrity watch. The Integrity Watch Officer/NCO may be filled by qualified E-5 and above personnel designated by the embarked squadron commanding officer or detachment officer in charge. Integrity watch duty assignments will be shared proportionally between all embarked units/detachments and based upon the relative size of each embarked unit/detachment.

This watch is set both underway and in port whenever there are aircraft aboard, and the ship is not at general quarters or flight quarters. The watch shall consist of one officer/NCO and as many enlisted personnel as may be required to ensure complete aircraft integrity. Integrity watch personnel shall be indoctrinated in equipment and procedures for flight deck/hangar deck firefighting. The Air Officer shall be responsible for the integrity watch.

#### 2.1.5.3 Primary Flight Control (PriFly)

The embarked unit shall provide personnel as advisors to PriFly during flight operations. The unit representative shall be fully qualified in at least one type embarked aircraft, be familiar with all unit policies, the day's flight schedule/mission, and act as an information/communication link between PriFly and the embarked unit. The LSO/LSO Under Instruction shall not be used in this capacity during AV-8B or F-35B operations. Training with PriFly for those selected representatives should be afforded and completed prior to embarkation.

## 2.2 TRAINING REQUIREMENTS

### 2.2.1 Ship Responsibilities

Maximum operational effectiveness and flight safety require extensive training for both ship’s company and embarked personnel, especially in the areas of command and control, aircraft coordination, and flight deck procedures.

Fleet commanders shall establish, through their type commanders, training and readiness standards for ship and aircraft unit personnel, including predeployment training and coordinated training in primary and secondary missions. Readiness standards and exercises shall be established to ensure effective use of the ship and aircraft.

Shipboard personnel shall be trained in all appropriate areas outlined in this paragraph. Training shall be scheduled as required to meet ship commitments when requested by operational commanders. After initial qualification of shipboard personnel is attained, ships shall be considered current in helicopter/tiltrotor/fixed-wing operations until:

1. One year has elapsed since helicopter/tiltrotor/fixed-wing operations were last conducted.
2. More than a 50-percent turnover in aircraft handling personnel has occurred since helicopter/tiltrotor/fixed-wing operations were last conducted.
3. The Air Officer and assistant Air Officer are simultaneously transferred. Either the Air Officer or assistant Air Officer must have operated helicopter/tiltrotor/fixed-wing aircraft or had appropriate training as contained in the following paragraph.

Air department personnel shall be trained in the areas listed below prior to conducting helicopter/tiltrotor/fixed-wing aircraft operations:

1. General operating characteristics of the specific aircraft.
2. Taxiing, towing, and tiedown requirements.
3. Aircraft firefighting, aircrew, and passenger rescue operations.
4. Aircraft personnel hazards and general safety.
5. Vertical takeoff, short takeoff, and vertical landing procedures (not required for helicopter operations).
6. Water servicing procedures.
7. Fueling and defueling procedures.

8. Aircraft salvage procedures.
9. Spotting aircraft for arming/dearming of air-launched weapons.
10. Air-launched weapons safety briefing.
11. Aircraft elevator operation procedures.

In addition, air department personnel and personnel directly involved in fixed wing flight deck operations shall meet the training requirements set forth in NWP 3.01.12.

### 2.2.2 Squadron/Detachment Responsibilities

The commanding officer/OIC shall coordinate applicable predeployment training requirements with the ship. The commanding officer/OIC shall ensure that all personnel complete Field Carrier Landing Practice (FCLP), Carrier Qualification/Deck Landing Qualification (CQ/DLQ), and the lecture syllabus outlined in Paragraph 2.3 prior to initial deployment. These requirements need not be repeated before every deployment; however, the commanding officer/OIC is responsible for providing refresher training as required for the safety of personnel and equipment. Ship's company personnel should assist in this training. If predeployment liaison is not possible, the predeployment lecture syllabus and CQ/DLQ shall be completed as soon as possible after embarkation and prior to commencement of normal flight operations. The commanding officer/OIC shall also ensure that all personnel assigned duties on the hangar or flight decks attend an aircraft firefighting course in accordance with OPNAVINST 3541.1.

### 2.2.3 Ship Deck Landing Qualifications/Carrier Qualifications

**Note**

The information contained in this paragraph is intended for use at the discretion of the ship's commanding officer for special circumstances (i.e., qualification of aircraft of another service or country) and are considered minimum standards for all types. Individual aircraft NATOPS manuals specifying more stringent requirements shall take precedence.

Minimum requirements for initial helicopter LHA/LHD deck landing qualification are 5-day and 5-night landings. (Two-day landings shall be accomplished prior to and on the same day as the night landings.) Qualifications are valid for 12 months. Minimum helicopter shipboard requalifications are 2-day and 2-night landings.

Minimum requirements for initial tiltrotor LHA/LHD deck landing qualification for launch/recovery are 5-day and 5-night landings, which should consist of Vertical Takeoff and Landing (VTOL), STO, and stern landings.

Minimum requirements for initial fixed wing carrier qualifications are 8-day and 8-night takeoffs and landings (2-day takeoffs and landings shall be accomplished prior to and on the same day as the night takeoffs and landings). Qualifications are valid for 6 months. Requirements after 6 months shall be 4-day and 4-night takeoffs and landings. Initial qualification requirements are necessary after 12 months.

## 2.3 PREDEPLOYMENT LECTURE SYLLABUS

### 2.3.1 Plane Captains/Crewchiefs

1. Aircraft handling procedures.
2. Care and use of flight deck personnel protective and communications equipment.
3. Responsibilities during launch and recovery.
4. Aircraft tiedown requirements and techniques.

### 2.3.2 Maintenance Personnel

1. Shipboard maintenance procedures.

2. Special shipboard safety precautions.
3. Care and use of flight deck personnel protective equipment and communications equipment.

### 2.3.3 Flight Crewmen

1. Launching procedures and signals.
2. Landing procedures and signals.
3. Aircraft control doctrine and procedures.
4. Emergency procedures peculiar to shipboard operations.
5. Special procedures for night and IFR.
6. Landing aids including stabilized glideslope indicator.
7. Communications.
8. Flight deck configuration and lighting.
9. Water survival and recovery procedures.
10. Search and rescue procedures.

### 2.3.4 Ordnance Personnel

1. Shipboard weapons handling procedures.
2. Shipboard ordnance safety instructions.
3. Care and use of flight deck personnel protective and communications equipment.

### 2.3.5 AV-8B/F-35B Phase I, II, III Training

AV-8B or F-35B phase I, II, and III training for ship's personnel is contained in Appendix B.

### 2.3.6 All Personnel

1. Duties and responsibilities during flight quarters, general quarters, abandon ship, man overboard, and other general drills.
2. Firefighting and damage control shipboard indoctrination.
3. Duties and responsibilities during Hazards of Electromagnetic Radiation to Ordnance (HERO) and EMCON conditions.
4. General shipboard safety and electrical safety programs.
5. Watch standing peculiar to shipboard operations.
6. Flight deck and hangar deck safety.
7. Water survival and recovery procedures.
8. Foreign Object Damage (FOD) indoctrination and prevention.
9. Darken ship procedures.
10. Hazards of composite materials.
11. Hazards, procedures, duties, and responsibilities during Night Vision Devices (NVD) operations and procedures for shifting from normal lighting to NVD-compatible lighting and back.

# CHAPTER 3

# Preparing for Flight Operations

## 3.1 AIR OPERATIONS

### 3.1.1 Air Planning Board

Normally, ships do not have operational or tactical control of embarked aviation units; therefore the sequence for processing air requests and scheduling air operations requires close coordination and cooperation among those units involved. An Air Planning Board should be convened no later than 24 hours prior to the execution of the next day's air operations. The function of this board is to process and schedule all requests for air support. This board is co-chaired by the CATF Air Officer or designee (TACRON Plans Officer), and the CLF Air Officer and consists of representatives from those units involved in the conduct of air operations to include embarked aviation units, ship's air department, ship's operations department, CATF/ship's combat cargo officers and those units requesting air support. Each organization requesting air support must submit requests in a timely fashion to the Air Planning Board for review of supportability. The end product of this board is to produce a CATF/CLF coordinated air plan that will serve as the source document for all air operations within the ATF. The CATF shall release the air plan to all ships/units involved in supporting air operations. Changes to air operations should be affected at the lowest level, but the CATF/CLF's Air Officer should be informed of all changes. Significant changes to the air plan should be properly routed through the CATF and CLF and then released as an amendment to the original message.

### 3.1.2 Air Plan

A ship's air plan reflects the ship's involvement in supporting air operations. The ship's air plan is submitted by the Air Operations Officer, reviewed by the ship's Operations Officer and Air Officer, and approved by the ship's commanding officer. When operating in conjunction with other ships as an ESG, ESF, or ARG, it is imperative that the air plan include information on flight operations from all aviation capable ships (with or without aviation assets embarked).

The air plan shall contain as a minimum the following information:

1. Event number.
2. Launch time.
3. Recovery time.
4. Number and model of aircraft.
5. Mission.
6. Call sign.
7. Circuit designators.
8. Date.
9. Sunrise, sunset, moonrise, moonset, phase, and percent illumination.
10. Aircraft armament/ordnance loading.
11. Any other information required, including but not limited to bomb jettison areas, airspace restrictions, political boundaries and other hazards to flight; distributed as an addendum to air plan.

Additional notes may include the following data, if appropriate:

1. The ready deck schedule.

2. Aircraft readiness conditions prescribed by the officer in tactical command.
3. Flight identification procedures in effect.
4. Readiness condition of standby aircraft.
5. EMCON and HERO conditions.
6. Any other information required, including restrictions or hazards to flight.
7. Fuel load required.

If mutually approved by the squadron/detachment and ship, the air plan may be expanded in scope to include normal flight scheduling information provided by the squadron/detachment, thereby eliminating the requirement for publishing a daily flight schedule. Where this scheduling method is used, the aircraft squadron commander/OIC shall maintain inherent authority and responsibility for scheduling assigned aircraft and crews.

An addendum to the air plan shall be distributed with the air plan as required. This may include but is not limited to:

1. An ESG air plan including all flight operations in the ESG operating area that may effect LHA/LHD air operations.
2. A "hot sheet" depicting operating areas, ordnance jettison areas, airspace and political boundaries, and any other pertinent information.
3. Current divert airfields information.

The addendum is for informational purposes and not signed by the ship's commanding officer.

### 3.1.3 Flight Schedule

Embarked aviation units will normally publish a flight schedule reflecting aircrew assignments, and times for launch and recovery. The flight schedule is promulgated by the squadron operations department and becomes an order of the squadron commander/detachment OIC.

**Note**

Distribution of the ship's air plan and flight schedule is in accordance with ship/squadron requirements.

### 3.1.4 Mission Briefing

A mission briefing shall be prepared by Tactical Air Control Center (TACC) for each helicopter/tiltrotor performing a logistics mission. The mission briefing shall contain, at a minimum, the following information:

1. Order of ships to be visited.
2. Ship name(s), hull number(s), call sign(s), Navigational Aid (NAVAID)(s).
3. Expected bearing/distance to each ship.
4. Pertinent radio frequencies.
5. Number of passengers to be delivered/picked up with pickup and delivery points.
6. Weight and description of cargo to be delivered/picked up.
7. Ship certification/waiver status of ships to be visited.

### 3.1.5 Functional Checkflights

Functional checkflights shall be scheduled by the squadron operations officer through the ship's air operations officer as soon as practicable after receiving the request. When feasible, such functional checkflights may be scheduled as part of routine multiple aircraft launches. When operations allow, a dedicated spot should be available for launch of nonscheduled functional checkflights. The availability of multiple deck spots and increased flight quarters for functional checkflights becomes increasingly important prior to amphibious operations.

**WARNING**

Ordnance shall not be loaded on aircraft scheduled for a Functional Checkflight (FCF).

Auxiliary power plant starts, folding/unfolding of rotor blades, engine turnups, and movements of aircraft shall be coordinated between squadron/detachment personnel and the air department.

### 3.1.6 Flight Plan

Written authorization, either in the form of an air plan, daily flight schedule, or a local flight clearance, is a prerequisite for all flights. Unscheduled flights shall be kept to a minimum. The requirements for filing flight plans and advisories vary with each operating area and are contained in the “Foreign Clearance Guide,” flight planning documents, and fleet operating directives. Whenever possible, functional checkflights should be scheduled on the air plan.

As a rule, flights originating aboard ship and terminating at a shore station, proceeding over land, or penetrating an ADIZ require the filing of a written flight plan with the ship by the pilot in command/flight leader. When firm information concerning departure and arrival times is available, the ship shall send a message as soon as possible and prior to the Estimated Time of Arrival (ETA) of the aircraft. Whenever possible, the ship shall establish voice communication with the destination airfield on administrative aviation frequencies (i.e., U.S. Air Force HF/SSB airways and command control stations, USN/USMC Raspberry nets, etc.).

The standard DD-175 military flight plan, DD-1801 DOD International flight plan, or an ICAO flight plan shall be filed in accordance with the appropriate FLIP documents.

The ship shall send a departure message (immediate precedence) including aircraft type, aircraft bureau number, and actual time of departure. This procedure applies specifically to flights of such distance that radio communication between the ship and the aircraft will be lost before communications are established with the shore station. The ship from which the flight originated shall annotate the time and retain the original copy of the flight plan for 6 months. Upon completion of the flight, the pilot in command/flight leader shall close out the flight plan. This shall be accomplished by an IMMEDIATE message to ship.

Flight advisories shall be filed for flights within ADIZ boundaries for all aircraft that will land back on board ship and are not covered by a flight plan. Squadrons/detachments shall prepare necessary flight plans (DD-175/DD-1801/ICAO) and file them with Amphibious Air Traffic Control Center (AATCC) as far in advance of scheduled launch times as possible. AATCC shall in turn file the flight plan/advisory with the appropriate agency via available radio or teletype facilities.

## 3.2 AQUEOUS FILM FORMING FOAM SYSTEM AND MOBILE FIREFIGHTING EQUIPMENT

The guidelines for manning and disposition of the AFFF system are outlined in NAVAIR 00-80R-14, “U.S. Navy Aircraft Firefighting and Rescue Manual.”

## 3.3 PRELIMINARY PROCEDURES

### 3.3.1 Flight Quarters Stations

Flight quarters stations shall be manned when directed and as prescribed in the ship’s watch quarter and station bill. Sample launch and recovery sequences with associated flight deck events and PriFly/Flight Deck announcements are contained in Appendix C. Squadron personnel shall man aircraft as appropriate. Some evolutions may not require that all flight quarters stations be manned. On such occasions, specific instructions shall be issued at the time flight quarters are set (for example, “Flight quarters for respot”).

All personnel assigned working stations on the flight deck or hangar deck, aviation fuels, and ordnance spaces shall wear serviceable flight deck safety boots or flight boots provided by parent command. Those personnel assigned flight quarters stations on or above the hangar shall wear jerseys as prescribed in Appendix D. All personnel whose duties require them to work on the flight deck shall wear cranial protection, goggles, leather gloves, sound attenuators, flotation gear, dye marker, and adequately secured whistle and survival light in accordance with Naval Surface Technical Manual (NSTM) S9086-CL-STM-010/CH-77. All personnel working on the hangar deck whose duties require them to work on deck edge elevators shall wear flotation gear, dye marker, and adequately secured whistle and survival light. During flight quarters, individuals wearing improper clothing shall not be permitted on the flight deck without the express consent of the Air Officer.

**WARNING**

Personnel burns from the exhausts and ducts of the AV-8B/V-22/F-35B aircraft are a hazard. The deck and other objects around the aircraft become extremely hot after only brief exposure to exhaust gases. Flight deck personnel shall be thoroughly briefed on these hazard areas and how to avoid them.

During night flight operations, LSE/directors shall use signal wands or NVD-compatible signal wands as appropriate. All other personnel shall exercise proper lighting discipline during night flight operations.

#### 3.3.1.1 Preliminary Procedures — AATCC

One and one-half hours before scheduled flight operations, AATCC shall be manned and the checkoff list in Chapter 9 of NAVAIR 00-80T-125 executed, commensurate with the EMCON plan in effect.

### 3.3.2 Air Officer

When flight quarters are sounded, the Air Officer shall ensure that:

1. Procedures prescribed in applicable bulletins and instructions for inspection and preparation for operation of the optical landing aids, elevators, aviation fuel system, and crash and firefighting equipment are followed. Discrepancies shall be reported to the bridge as soon as they are detected. A decision to conduct flight operations when discrepancies are known to exist in any of the above equipment shall be made only by the ship's commanding officer.
2. FOD walkdowns are conducted in accordance with applicable directives.
3. Communications equipment is tested.
4. All required stations are properly manned.

### 3.3.3 Landing Signal Officer

The LSO is responsible for the safe and expeditious launch and recovery of AV-8B and F-35B aircraft aboard ship. During fixed-wing operations, the LSO shall advise the Air Officer on FOD hazards, effects of exhaust gases, and operational mission requirements to aid in the determination of safe sequencing and placement of aircraft on the flight deck. The primary responsibility for determining acceptable pilot performance in a carrier approach rests with the LSO. It is the LSO's responsibility to wave off aircraft that are not in an acceptable approach position to permit a safe landing. He or she shall be directly responsible to the ship's Commanding Officer, through the Air Officer, for the performance of LSO duties aboard ship and shall keep the Air Officer informed of LSO whereabouts during flight quarters. The Air Officer and the assistant Air Officer shall be trained by the squadron to provide assistance as required.

It is the responsibility of ships Pri-Fly personnel, with the assistance of the AV-8B/TAV-8B Landing Signal Officer (LSO), to ensure that conditions for launch and recovery operations are within the most conservative of the limits between LHA/LHD Gen Series NATOPS and LSO TAPS. All AV-8B/TAV-8B launch and recovery operations shall be conducted under positive LSO control.

#### 3.3.3.1 Equipment and Personnel Requirements

The LSO shall ensure that all the equipment and personnel requirements as defined in NAVAIR 00-80T-111 have been met before beginning AV-8B or F-35B shipboard flight operations.

### 3.3.4 Flight Deck Supervisor

The flight deck supervisor shall be a qualified flight deck fly petty officer, leading petty officer, or chief petty officer, and shall report directly to the Air Officer for the performance of aircraft launch duties. The flight deck supervisor shall be thoroughly familiar with each type aircraft and be able to recognize proper and improper aircraft functioning just prior to launch.

### 3.3.5 Landing Signal Enlisted

The LSE under the supervision of the Air Officer is responsible for visually signaling to the helicopter, thus assisting the pilot in making a safe takeoff and/or approach and landing on the ship. The LSE is responsible for directing the pilot to the desired deck spot and for ensuring general safety conditions of the flight deck area, to include control of the flight deck crew. He or she shall ensure that on signal, helicopters are safely started, engaged, armed, launched, recovered, dearmed (safed), and shutdown and that all tiedowns are removed prior to lift-off and secured after landing. The LSE’s signals are advisory in nature, with the exception of waveoff and hold, which are mandatory.

### 3.3.6 Fixed Wing Launch Officer

The fixed wing launch officer has been trained by aircraft squadron or qualified ship’s personnel and is designated in writing by the ship’s commanding officer. The fixed wing launch officer shall report directly to the Air Officer for the performance of launch duties. The launch officer shall be thoroughly familiar with the specific type of aircraft and be able to recognize proper and improper aircraft functioning just prior to launch.

### 3.3.7 C5I Officer

The C5I officer is responsible for ensuring the following items are completed in preparation for flight quarters.

1. Personnel are immediately available to correct equipment discrepancies in Primary, AATCC, and TACC. During all Case II/III operations a minimum of one qualified SPN-35 or Direct Altitude and Identity Readout (DAIR) technician shall be physically assigned to AATCC.

2. Communications plan directed dedicated radios and assigned frequencies are available to control agencies for equipment checks and flight operations. Minimum dedicated radio and frequency requirements for flight operations involving multiple aircraft are as follows:

   a. Primary: 3 UHF radios/frequencies, UHF/VHF Guard frequencies, and a standalone back-up radio.

   b. AATCC: 4 UHF radios/frequencies, UHF/VHF Guard frequencies, ship-to-ship/shore radios, and a standalone back-up radio.

   c. TACC: 2 UHF radios/frequencies, one secure UHF radio/frequency, UHF/VHF Guard frequencies, and HAVEQUICK.

**Note**

Minimum dedicated radio and frequency requirements may be waived by the commanding officer after determining from controlling agencies the safety impact on flight operations.

3. ATC radar video and frequency recording devices and media are maintained and safeguarded in accordance with ATC NATOPS (NAVAIR 00-80T-114).

## 3.4 OPTICAL LANDING AIDS AND FLIGHT DECK/HANGAR DECK LIGHTING

The Air Officer shall ensure that the following procedures are accomplished for the utilization of optical landing aids and flight deck/hangar deck lighting if required for operations.

1. When night operations are planned, flight deck lighting and optical landing aids will be checked for proper operation and physical integrity at least 1 hour before sunset.
2. For helicopter/tiltrotor operations, the following flight deck lighting and optical landing aids are required as a minimum for night or IFR operations:
   a. Flight deck lighting.
      (1) Spot pad lights (red and white).
      (2) Overhead floodlights (amber or blue).
      (3) Deck edge lights (blue).
      (4) Deck surface floodlights (white or red).
      (5) Rotary beacon signalling system (red, amber, green).
      (6) Low-pressure sodium floodlights (amber).
   b. Optical landing aids.
      (1) Waveoff light system.
3. For fixed wing operations, the following flight deck lighting and optical landing aids are required as a minimum for night or IFR operations:
   a. Flight deck lighting.
      (1) All helicopter night/IFR flight deck lighting with the exception of the spot pad lights.
      (2) Tramline/STO lights (white).

**Note**

On ships that are F-35B certified, the Fixed Wing Tramline is shifted 3 feet 6 inches to port, including associated markings and deck lighting. Tramline lights have been decreased from 20 light pairs to 14 light pairs, which increased spacing. Vertical line−up light (drop−down light) is now aligned with starboard tramline lights. The hover position indicator and V/STOL optical landing system (OLS) have been adjusted for the new tramline location. Wind diagrams were not affected by this change, and sufficient spacing between V/STOL aircraft to ship structures and port deck edge has been maintained.

      (3) Nozzle rotation lights (amber).
      (4) Forward port, port, starboard and athwartship edge lights (white).
      (5) Safe parking lights (red).
      (6) Vertical dropline lights (red).
   b. Optical landing aids.
      (1) V/STOL OLS.
      (2) Waveoff/cut light system.
      (3) Hover Position Indicator (HPI).
4. All flight deck lighting and optical landing aids shall be utilized at minimum intensity consistent with safety.
5. Requirements for lighting during night or IFR operations may be waived by the LHA/LHD commanding officer.

6. Lighting other than amber/red lights may be used on the hangar deck to enhance aircraft maintenance, handling efficiency, and safety. When restrictive lighting measures are in effect on the flight deck, appropriate steps shall be taken to ensure masking of the other than amber/red hangar bay lights. Consideration shall be given to closure of hangar bay doors if conditions so warrant.

## 3.5 FLIGHT DECK AUGMENTATION

The expeditious folding and spreading of rotor blades, initial breakdown and final position of tiedowns, rotor blade security, and other similar functions shall be accomplished by qualified personnel from the embarked aviation units.

## 3.6 BRIEFING OF FLIGHTCREWS

It is the responsibility of squadron or unit commanders to ensure that all flightcrews have been properly briefed and have sufficient information to complete the assigned mission. Briefing checklists shall be used as required by applicable aircraft NATOPS flight manuals. Each briefing shall include EMCON procedures, if applicable, and procedures to be followed in the event of communication or navigational aids failure. AATCC shall provide the following briefing information prior to launch:

1. Launch and recovery times.
2. PIM.
3. NAVAIDs status and frequencies.
4. Weather in the area of the ship.
5. Weather at divert fields and en route, if available.
6. Emergency data:
    a. Bearing and distance to nearest land.
    b. Bearing and distance to nearest suitable landing field.
    c. NAVAIDs, frequencies, and facilities at nearest field.
    d. Ready deck call sign/hull number, frequencies, NAVAIDs, and range/bearing from ship at the time of launch.
    e. Emergency Final Bearing (EFB).
    f. Emergency marshal fixes/altitudes/approach times.
7. Air Traffic Control (ATC) data:
    a. Departure/rendezvous radials.
    b. Departure frequency and IFF/SIF mode and code.
    c. Special procedures for ZIP-LIP/EMCON/NVD conditions, if applicable.
8. Any restrictions or hazards to flight including ordnance restrictions, night, unaided/NVD operating areas and/or corridors.
9. Pertinent information not included in the air plan.

## 3.7 CARRIER QUALIFICATION PERIODS

### 3.7.1 Number and Type Aircraft

The maximum number of aircraft in the CQ/DLQ pattern is six, unless modified by the Air Officer. During initial qualification, mixed aircraft (helicopter and fixed wing) shall not occupy the same CQ/DLQ pattern simultaneously. Tiltrotor may operate with either helicopter or fixed wing in the appropriate mode.

### 3.7.2 Interval

The pilot is primarily responsible for maintenance of interval, especially during Visual Meteorological Conditions (VMC). Both the Air Officer and LSO shall monitor the pattern and issue instructions to adjust interval as necessary.

### 3.7.3 Case III Carrier Qualification Landings

Case III landings should be conducted in accordance with Case III recovery procedures. AATCC positive control and single frequency control shall be maintained.

### 3.7.4 Carrier Qualification/Refresher Landing

During helicopter, tiltrotor and/or fixed wing CQ/DLQ, a responsible squadron representative should be present in PriFly. The squadron/detachment will compute and provide to AATCC the fuel required for each model aircraft to reach the briefed divert. AATCC will update this information as the diverts and distances change.

### 3.7.5 Aircraft Landings Required

The squadron shall keep the Air Officer apprised of the number of landings required for each aircraft.

### 3.7.6 Divert Data

The air operations officer shall provide the Air Officer with accurate divert data. Before and/or during CQ/DLQ, the air operations officer shall compute distance and bearing to divert field and coordination with the squadron representative in PriFly will update the fuel required for the model aircraft involved. Divert data shall be broadcast on the land/launch frequency by PriFly or AATCC as appropriate.

## 3.8 PASSENGER/CARGO MOVEMENTS (HELICOPTER)

### 3.8.1 Night Overwater Passenger Transfer

Night overwater helicopter and tiltrotor passenger flights are governed in accordance with CNAF M-3710.7.

### 3.8.2 Combat Cargo Officer

The Combat Cargo Officer (CCO) is responsible for the safe and orderly flow of troops, passengers, mail, and cargo. Duties include the following:

1. Shall contact Air Operations Officer no later than 1 hour prior to flight operations for an air plan brief.
2. Compile a complete troop or passenger manifest to include:
    a. Last name and initials.
    b. Rank/rate.
    c. DoD or applicable identification number.
    d. Organization.
    e. Destination.
    f. Priority (if any).
3. Conduct troop or passenger preflight briefing to include:
    a. Flight deck precautions.
    b. Primary and alternate routes to aircraft.
    c. Personal survival equipment and its use.
    d. Aircraft ditching and emergency egress stations.

4. Ensure that personnel transiting the flight deck do not cause a FOD hazard and are escorted with regard to personal safety. Ensure that passengers are provided approved hearing and eye protection as well as approved flotation devices. All personal protective gear shall be properly donned by passengers and worn at all times while on the flight deck.

5. Be familiar with load capacities/restrictions, survival equipment carried, and emergency escape procedures for all aircraft models expected on board for logistic purposes. Inspect cargo prior to loading to ensure it is embarked in accordance with existing instructions.

6. Deliver mission briefing cards to helicopter as directed by AATCC. Mission briefing card contents are delineated in Paragraph 3.1.4 of this manual.

## 3.9 THE ORDNANCE LOAD PLAN

An ordnance load plan will be utilized as a supplement to the air plan for aircraft ordnance loads. No changes will be made to the ordnance load plan without approval. It is the responsibility of the Ordnance Handling Officer to ensure strict conformance to the ordnance load plan.

# CHAPTER 4

# Air Traffic Control Doctrine

## 4.1 ATC RESPONSIBILITIES

### 4.1.1 Operations Officer

The ship's Operations Officer is responsible for the control of airborne aircraft, except when control is assigned to other authority. The control refers to all airborne operations not incidental to the actual launch or recovery of aircraft.

### 4.1.2 Air Operations Officer

The Air Operations Officer is responsible for coordination of all matters pertaining to flight operations.

### 4.1.3 AATCC Officer/Current Ops

The AATCC Officer is responsible to the Air Operations Officer for the execution of the Air Plan (Current Ops) and the proper functioning and manning of the AATCC.

### 4.1.4 Air Officer

The Air Officer is responsible for visual control of all aircraft operating in the control zone. Under Case I and II conditions, this responsibility may be extended beyond the control zone to include all aircraft that have been switched to Air Officer's control frequency. For special operations such as bombing a sled or air demonstrations, the Air Officer may exercise control outside of the control zone. Additionally, the Air Officer is the control zone clearing authority. Agencies desiring to operate aircraft within the control zone shall obtain the Air Officer's approval prior to entry. This clearance shall include:

1. Operating instructions as required for avoiding other traffic.
2. Information concerning hazardous conditions.
3. Altitude and distance limitations to which aircraft may be operated.

### 4.1.5 Combat Information Center Officer

The Combat Information Center (CIC) officer is responsible for mission control of aircraft assigned. This includes providing separation from other traffic operating in the vicinity of the ship and ensuring that mission controllers know the basic procedures for air traffic control. Additionally, the CIC officer shall ensure that controllers know their responsibility for traffic advisories to aircraft operating in visual conditions and for safe separation of aircraft operating in instrument conditions. Upon request, the CIC officer shall provide information concerning areas of special operations, such as air-to-surface weapon drops and air-to-air missile shoots.

### 4.1.6 Tactical Air Officer

The Tactical Air Officer controls and coordinates airborne tactical aircraft and helicopter operations with supporting arms and other air operations through the TACC (afloat).

## 4.2 AIRCRAFT CONTROL CRITERIA

Weather in the control zone is the most prominent factor affecting the degree of control necessary. The type of control to be employed during departures and recovery is determined by the Air Officer, after coordination with the LSO, AATCC Officer and Air Operations Officer, unless otherwise specified by higher authority.

### 4.2.1 Concurrent Operations

Amphibious Task Force Operations often require concurrent flight operations by two or more aviation, mine countermeasures support and/or amphibious aviation ships. When this occurs, CVs, LHAs, and LHDs should be assigned operating areas of sufficient size to preclude mutual interference. Operational constraints may at times require aviation and/or amphibious aviation ships to operate within 10 nm of one another, creating a conflict of overlapping control zones. To ensure operational safety and efficiency when such operations are anticipated, the OTC shall promulgate special instructions (spins) that delineate the limits of each ship's airspace control, as well as the procedures to be used for VMC operations between contiguous control zones.

#### 4.2.1.1 Planning

Detailed prior planning should be conducted to prescribe the responsibilities and procedures to be used during anticipated concurrent operations. Planning considerations should include, but are not limited to:

1. Meteorological conditions (IMC, VMC).
2. Type and number of aircraft (characteristics affecting control requirements).
3. Type, number, and disposition of ships.
4. Type of operations planned (i.e., EMCON, welldeck operations, night VMC, Vertical Replenishment [VERTREP], refueling, etc.).
5. Communications (i.e., equipment frequency availability, etc.).

#### 4.2.1.2 Operations

During concurrent flight operations (fixed wing, tiltrotor or helicopter) by two or more LHAs/LHDs or between LHA/LHD and CV/air-capable ship, each ship shall remain in its assigned operating area of order to reduce air traffic coordination problems. AATCC shall closely monitor and coordinate flight patterns to avoid mutual interference. Prelaunch procedures shall include exchange of air plans and notification by air-capable ships and acknowledgment by the LHA/LHD prior to any aircraft operations between contiguous control zones and/or within 10 nm of the LHA/LHD.

**Note**

Unscheduled launches or recoveries that are because of emergency or operational necessity are permissible, but shall be coordinated with the OTC as soon as possible because of the inherent danger of contiguous flight operations.

### 4.2.2 Electronic Control

#### 4.2.2.1 IFF

Mode II codes shall be programmed to indicate aircraft side numbers, unless operational requirements dictate otherwise, in order to reduce misunderstandings of aircraft identification. When possible, Mode III codes and tactical call signs should differ substantially from aircraft side numbers to reduce misunderstandings of aircraft identification.

1. CIC, AIC and TACC may track and control aircraft using tactical call sign, by observing the Mode III beacon display.
2. AATCC may track and control aircraft using aircraft side number, by observing the Mode II beacon display.

#### 4.2.2.2 Positive Control

This control shall be utilized under the following conditions in the control zone:

1. Ceiling of 1,000 feet or less for fixed-wing operations.

2. Ceiling of 500 feet or less for helicopter operations.
3. Forward flight visibility of less than 5 miles for fixed wing and tiltrotor V-22 Airplane Mode (APLN) mode operations.
4. Forward flight visibility of 1 mile or less for helicopter operations and tiltrotor conversion mode operations.
5. All unaided flight operations between one-half hour after sunset and one-half hour before sunrise except as modified by the OTC or ship's commanding officer.

**Note**

Night CQ/DLQ pattern is excluded from positive control, provided a visible horizon exists.

6. During mandatory letdown in thunderstorm areas.
7. In other situations where supervisory personnel can anticipate weather phenomena that might cause difficulty to pilots.

#### 4.2.2.3 Advisory Control

This control shall be utilized when the traffic density in an operating area requires a higher degree of control for safety of flight than required under visual flight rules. Advisory control is normally limited to VMC and is recommended for all operations in or adjacent to oceanic control areas or routes.

#### 4.2.2.4 Monitor Control

This control shall be utilized only when aircraft are operating VMC outside controlled airspace and the responsibility for separation from other traffic can be safely assumed by the pilot.

#### 4.2.2.5 Nonradar Control

This control shall be used when shipboard radar is inoperative or so degraded as to be inadequate to provide radar separation of air traffic under conditions normally requiring positive control. The decision to attempt control of aircraft at night or in instrument flight conditions shall be made with careful consideration of factors such as:

1. Actual meteorological conditions.
2. Degree of radar degradation.
3. Expected duration of radar degradation.
4. Fuel states/fuel available for delays.
5. Divert field suitability/availability.
6. Operational requirement.
7. Departure/recovery in progress at the time a nonradar environment develops.
8. Availability of other surface or airborne platforms to provide radar traffic separation and approach information.

**Note**

JPALS capable aircraft can get position information from the ship by the TACAN or JPALS RelNav function, or from an escort ship's TACAN. And while the TACAN and JPALS are determined to correlate, control and separation exercised by AATCC during nonradar is based on a single NAVAID and the Ship's TACAN is the common RelNav source for all aircraft.

### 4.2.3 Electronic Emission Control

The Operations Officer or representative will hold detailed briefings prior to conducting operations under EMCON conditions. It may be necessary to develop special procedures for performing the following operations during various conditions:

1. Aircraft handling.
2. Launch.
3. Departure.
4. Mission.
5. Arrival.
6. Recovery.
7. Maintenance.

Detailed briefings covering responsibilities and procedures shall be conducted prior to operating under EMCON conditions. All flightcrew members, controllers, and aircraft handling personnel shall attend such briefings and familiarize themselves with all procedures within their area of responsibility. Overhead messages shall include applicable EMCON instructions.

## 4.3 ADMINISTRATIVE CONTROL AGENCIES

### 4.3.1 Green Crown

Green Crown (GC) is responsible for detection and identification for ESGs. Contact with GC must be established as soon as practical and in accordance with the applicable theater operating procedures.

When checking in with GC, the following minimum information is required:

1. Aircraft call sign (number and type of aircraft).
2. Mission number.
3. Position/altitude using BULLSEYE, TACAN cuts, established geographic reference, or latitude/longitude in accordance with SPINS.

### 4.3.2 ICEPACK

Icepack is responsible for the mission control of the airspace assigned to the ESG. That airspace may extend out to 50 nm. Icepack provides multiple services to assigned aircraft to include radar control, procedural deconfliction, and administrative accounting of ESG aircraft.

### 4.3.3 AATCC

AATCC, commonly referred to as Center, is the air traffic control agency on the LHA/LHD that is responsible for providing IMC approach and departure control services. AATCC is also responsible for maintaining the status and tactical control of airborne helicopters in support of amphibious assaults as directed by the TACC.

### 4.3.4 Tower

Tower controls airspace within 5 nm and up to and including 2500 feet of the LHA/LHD. The tower can be contacted on the land/launch frequency and no aircraft should operate within tower's airspace without permission.

## 4.4 CONTROL ZONE/CONTROL AREA

The purpose of air traffic control is the safe, orderly flow of air traffic; AATCC and PriFly are responsible for safe separation and control of all aircraft traffic operating within the Control Area. When TACRON is embarked, TACC will assume mission/strike control of aircraft within the Control Area but outside the Control Zone in accordance with NTTP 3-02.1.3 Amphibious/Expeditionary Operations Air Control.

The ship's control zone/control area is depicted in Figure 4-1.

**WARNING**

The operating procedures contained in this publication relating to ship's control zones may not be recognized or honored by other than USN/USMC aircraft. Civil aircraft or aircraft of other services may enter or transit the control zone without clearance, radio contact, or regard for procedures set forth herein, and may only adhere to the basic requirements of FAR Part 91 (no closer than 500 feet to any vessel, and less for helicopters in uncontrolled airspace); others may not be aware of the ship's presence or conduct of flight operations. Utmost vigilance/surveillance is required in areas near airways, airfields, controlled airspace, or special use airspace.

1. The control zone will not be effective in any portion of the area that extends into, under, or abuts control airspace airfields. The upper limit of the control zone must not penetrate the Floor of Controlled Airspace (FCA), floor of a Terminal Control Area (TCA), or other controlled airspace. Likewise, the lateral extent is not effective in any portion that extends into or abuts controlled airspace as defined in applicable FAA/ICAO aeronautical publications.
2. The control zone is not effective in an area that lies within a special use airspace (restricted area, MOA, and so forth) without authorization of the designated controlling agency.
3. The outer limit of the control zone shall not be established closer than 10 nm to any airway, controlled airspace, or special use airspace, unless approved by cognizant authority (controlling activity, scheduling activity, or FAA facility). Ships desiring to activate a control zone in fleet operating areas in uncontrolled airspace, underlying airways or controlled airspace, or adjacent to special use airspace, shall coordinate with and gain authorization/approval from the applicable Fleet Area Control and Surveillance Facility (FACSFAC), OPAREA coordinator, numbered fleet commander, or FAA facility.
4. The factors above shall be considered in relation to operations involving a ship's control area.

### 4.4.1 Aircraft Training Sectors

The following sectors are provided to ensure lateral and vertical separation of aircraft during amphibious flight operations. AATCC will assign sectors and provide altitude deconfliction as necessary. Pilots may also request a sector(s) for training purposes. All sectors will be based on magnetic radials (Figure 4-2).

## 4.5 AIRCRAFT SEPARATION CRITERIA

The following separation standards shall be utilized for aircraft under positive control. These criteria do not apply to tactical maneuvers such as air intercept rendezvous and close ASW action.

### 4.5.1 Lateral Separation

1. The following separation standards apply to aircraft controlled by designated air search radars that rotate in excess of 7 rpm.
   a. Aircraft operating at 50 miles or more from the monitoring antenna shall be separated by a minimum of 5 miles.
   b. Aircraft operating within 50 miles of the monitoring antenna, and not within 10 miles on a designated approach, shall be separated by a minimum of 3 miles.

c. Aircraft on a designated approach or established downwind and inside of 10 miles shall be separated by a minimum of 2 miles.

d. Aircraft established on final within 5 miles shall be separated by a minimum of 1-1/2 miles.

**Note**

Air Search Radars that rotate in excess of 7 rpm are the only radars acceptable for an ASR approach.

2. Aircraft provided positive separation via nonradar control, utilizing a published approach/departure, shall be separated by a minimum of 2 minutes (5 miles separation when using DME).

3. Aircraft provided positive control with all other radars shall be separated by a minimum of 5 miles.

**Note**

Air Search Radars that rotate in excess of 7 rpm are the only radars acceptable for applications of lateral separation of less than 5 nm.

Figure 4-1. Optimal ATF Ship Control Area and Control Zone Dimensions

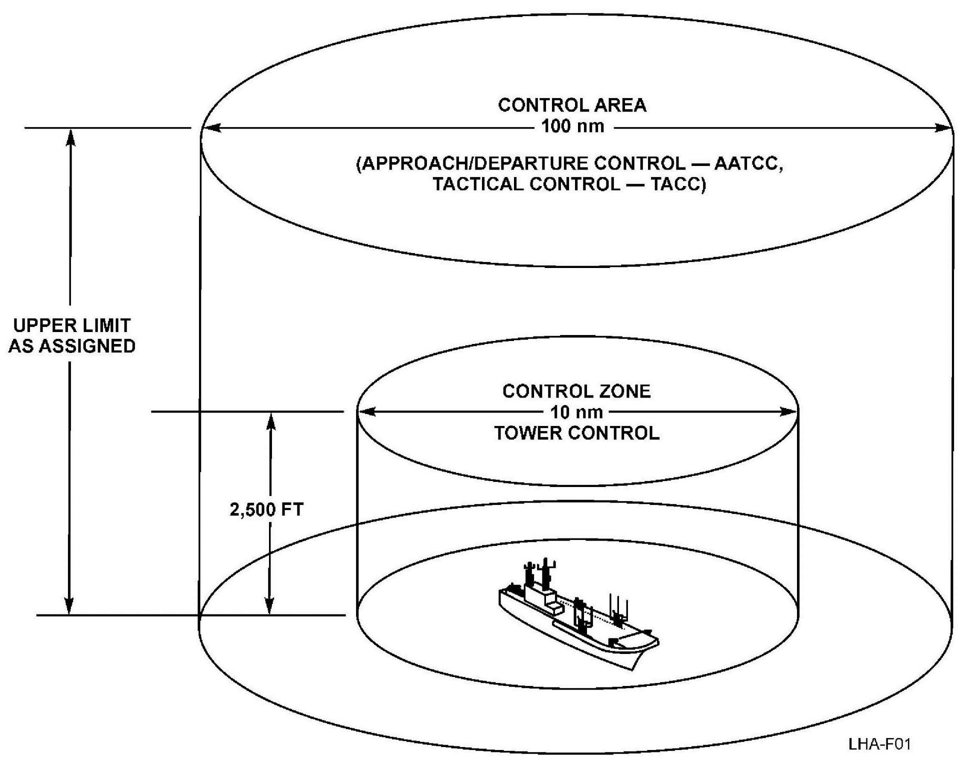
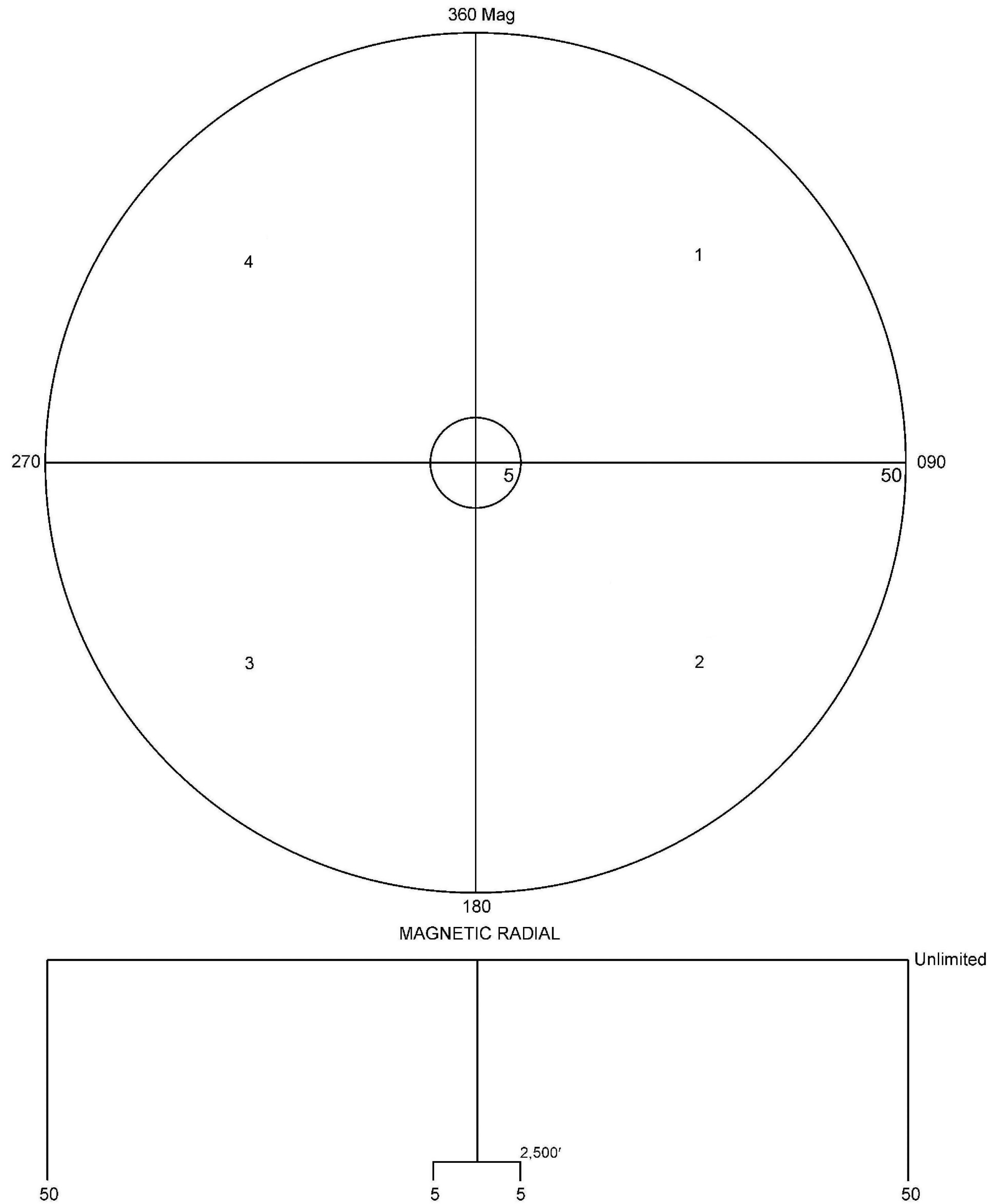


Figure 4-2. Sector Designation



**Note**

DAIR is capable of multiple surveillance inputs to display a fused target. When JPALS is the only sensor providing input and JPALS capable aircraft are the only targets displayed, non-radar control is the only degree of control acceptable to ensure safe separation between surveilled and non-surveilled aircraft.

### 4.5.2 Vertical Separation

Jet and turboprop aircraft operating at altitudes up to and including FL 290 shall be separated by 1,000 feet vertically. Aircraft operating at altitudes above FL 290 shall be separated by 2,000 feet vertically. Reduced Vertical Separation Minimum (RVSM) equipped aircraft may use 1,000 foot vertical separation minimum above FL 290.

Helicopters and tiltrotor aircraft in conversion mode shall be separated by 500 feet vertically. Fixed wing and tiltrotor aircraft in airplane mode shall be separated from helicopters and tiltrotor aircraft in conversion mode by 1,000 feet vertically. Vertical separation may be reduced to 800 feet inside of 12 nm.

AATCC shall verify which mode of flight tiltrotor aircraft are utilizing prior to applying appropriate altitude separation minima.

## 4.6 COMMUNICATIONS CONTROL

All aircraft shall be under positive communications control while operating at sea unless otherwise directed.

Pilots should not switch without clearance from the controlling agency. Communications procedures during ZIP-LIP/EMCON conditions shall be specified during preflight briefing.

### 4.6.1 Control of Radio Circuits

Control of radio circuits shall be exercised as follows:

1. AATCC.
   a. Primary control of assigned ship-to-shore air traffic control and intratype administrative frequencies.
   b. Primary control of assigned AATCC frequencies.
   c. Primary control of helicopter direction (tactical) frequencies.
   d. Secondary control of aircraft guard frequencies.
   e. Secondary control of land/launch frequencies.
   f. Secondary control of air tactical frequencies.
2. CIC/TACC.
   a. Primary control of all air tactical frequencies not otherwise assigned.
   b. Primary control of aircraft guard frequencies.
   c. Secondary control of ship-to-shore air traffic control and intratype administrative frequencies.
3. PriFly.
   a. Primary control of land/launch frequencies.
   b. Secondary control of aircraft guard frequencies.
   c. Secondary control of departure control and final approach frequencies.
   d. Secondary control of assigned ship-to-shore air traffic control and intratype administrative frequencies (where installed equipment permits).

### 4.6.2 Voice Procedures

Strict radio discipline is mandatory. Voice procedures shall be concise and should not vary from standard air control phraseology as set forth in NTTP 6-02.1, FAAO 7110.65, and NAVAIR 00-80T-125.

#### 4.6.2.1 Type/Model/Series (T/M/S) Call Signs

To reduce confusion with aircraft identification when operating in LHA/LHD airspace, discriminate call signs shall be used for each aircraft. Aircraft call sign (squadron name and side number), shall be used when communicating with AATCC and tower. ATO call signs shall be used when communicating with tactical agencies.

### 4.6.3 Recording of Radio Circuits

Radio circuits used for the control of air traffic shall be recorded continuously during hours of operation.

### 4.6.4 Communications Security

Communications Security (COMSEC) is best accomplished by strict adherence to established principles of radio discipline. Additionally, secure voice radio equipment in naval aircraft and ships offer a significant COMSEC capability that should be utilized to the greatest extent practicable. All units with COMSEC capability should develop tactical doctrine designed to deny Signal Intelligence (SIGINT) forces access to vital intelligence. Detailed functional descriptions of COMSEC equipment are found in pertinent classified documents. All personnel who have access to radio equipment must be briefed that certain restrictions exist on all radio transmissions to prevent disclosure of Essential Elements of Friendly Intelligence (EEFI) to the enemy.

## 4.7 EMERGENCY CONTROL PROCEDURES

From a control standpoint, emergencies fall into five categories:

1. Communications failure.
2. NAVAIDs failure.
3. Aircraft systems failure.
4. Crewmember injury or illness.
5. Ship system casualty.

The ultimate resolution of an emergency involves a command decision based on the type of emergency and weather conditions in the recovery area. It is imperative that AATCC collect every pertinent detail that might aid in the evaluation of an emergency and keep the command and other interested agencies properly informed. This section provides basic procedures to be followed when communications and navigational equipment have failed. Emergencies, when navigational aids and/or communications are available, should be handled according to existing circumstances. Emergency procedures for aircraft system failures are covered in the appropriate NATOPS flight manual.

**Note**

There shall be a UHF radio with a battery back up capability available in AATCC and Pri-Fly in the event of a Ship System Casualty to ensure the continuous communications and the safe and expeditious control of all aircraft in the Ships operating area.

### 4.7.1 Initial Control Responsibility

The initial control responsibility for an aircraft emergency rests with the agency exercising control of the aircraft when the emergency occurs. Aircraft in distress should not change radio frequencies if satisfactory radio contact is established, nor should controllers require frequency changes of aircraft in distress.

### 4.7.2 Basic Emergency Control Procedures

Procedures for pilots to follow when experiencing communication and/or navigation equipment failure are listed in Figure 4-3. Lost communications emergency squawks are listed in Figure 4-4. Controlling agencies shall be familiar with and alert for conditions indicating communications or navigational failures and perform the following as appropriate:

1. Attempt to establish communications with and control of the aircraft.
2. Vector the aircraft as appropriate.

If unable to communicate with the aircraft:

1. Identify on radar and maintain a track.
2. Vector available aircraft to join if practical.
3. Clear all other aircraft from track of distressed aircraft.
4. Broadcast instructions and essential information in the blind.

### 4.7.3 Crewmember Injury or Illness

In the event of crewmember injury or illness, communicate nature of injury/illness, assistance required, and intentions to controlling agency. Aircraft shall normally be handled as an emergency and vectored for immediate recovery. Ejection/ditching procedures shall be in accordance with aircraft NATOPS when divert or recovery is not possible.

### 4.7.4 Ship System Casualty

Ship system casualty can result in complete shipboard communication equipment and navigational aid failure. Certain casualties may result in the inability to maneuver to Base Recovery Course (BRC) and provide optimum winds. Pilots shall be familiar with and alert for conditions indicating ship system casualty and perform the following as appropriate:

1. Attempt to establish communication and coordination with other aircraft.
2. Enter Charlie pattern and obey visual signals.
3. Execute divert procedures.
4. Execute ejection/ditching procedures in accordance with aircraft NATOPS flight manual.

Figure 4-3. Basic Emergency Procedures for Communications/Navigational Equipment Failure

| TYPE OF FAILURE | FLIGHT CONDITIONS | |
|---|---|---|
| | VMC[1] | IMC[1] |
| Transmitter failure with or without receiver failure (navigation aids serviceable). | 1. Join up if possible.<br>2. Maintain VMC.<br>a. Enter VMC landing pattern.<br>b. Use standard visual signals when in range of ship.<br>c. Watch for light signals from ship.<br>3. Squawk Mode III 7600, "IDENT," and Mode I in accordance with Figure 4-1.<br>4. If receiving, follow instructions.<br>5. Broadcast intentions periodically, whether or not transmitter is known to be operable. | 1. Transition to VMC if possible and continue VMC.<br>2. Proceed to emergency marshal.<br>3. Squawk Mode III 7600, "IDENT," and Mode I in accordance with Figure 4-1.<br>4. Watch for joinup.<br>5. Hold at emergency marshal until Emergency Expected Approach Time (EEAT).<br>6. Commence approach at EEAT. Squawk in accordance with Figure 4-1.<br>7. If receiving, follow instructions.<br>8. Broadcast intentions periodically whether or not transmitter is known to be operable. |
| Navigation aids and transmitter failures with or without receiver failure. | 1. Perform same procedures as for communication failure, or<br>2. When position is unknown:<br>a. Navigate by Dead Reckoning (DR) to best position.<br>b. Squawk in accordance with Figure 4-1 or EMERGENCY as required.<br>c. Fly appropriate triangles in accordance with Flight Information Handbook.<br>d. Watch for joinup.<br>3. If all above fails, bingo to nearest suitable field at appropriated fuel state. | 1. Transition to VMC if possible and maintain VMC.<br>2. Navigate by DR to best position.<br>3. Squawk in accordance with Figure 4-1 or EMERGENCY as required.<br>4. Fly appropriate triangles in accordance with Flight Information Handbook.<br>5. Watch for joinup.<br>6. If receiving, follow instructions.<br>7. Broadcast intentions periodically whether or not transmitter is known to be operable. |
| NOTE:[1] All procedures are for single aircraft. When in company, VMC or IMC, remain in company and use hand signals between aircraft. | | |

Figure 4-4. Lost Communication Emergency Squawks

Mode III — An aircraft with radio difficulties (transmitter and/or receiver) should squawk Mode III Code 7600 or emergency Code 7700 as appropriate.

Mode I — The following codes will amplify difficulties in conjunction with a Code 7600 or 7700. No receiver shall mean that the primary UHF, auxiliary receiver, and UHF/VHF guard receiver are inoperative. If any receiver is operative, the controller is capable of controlling the aircraft utilizing IFF standby squawks and/or aircraft turns to acknowledge receipt of instructions.

**Note**

Below 2,500 feet, pilots must be aware of the dangers of changing IFF codes.

1. HEFOE Squawks.

| Mode I First digit | Second digit | Mode III |
|---|---|---|
| 0 — OK | | |
| 1 — Hydraulic | 1 — No Rec. TACAN/JPALS ok | 7700/7600 (with HEFOE code, use Code 7700) |
| 2 — Electrical | 2 — No Rec. ADF ok | |
| 3 — Fuel | 3 — Rec. OK. No NAVAID(s) | |
| 4 — $O_2$ | | |
| 5 — Engine | | |

2. Assistance Required Squawks.

All 7 — Mode I squawks indicate no receiver and no NAVAID(s).

| Mode I | Mode III |
|---|---|
| 70 — Desired tanker to join | Fuel on board (up to 7,000 lbs.) |
| 71 — Intend bingo | |
| 72 — Desired aircraft to assist | |

3. Limited Communication Squawks.

Requires a 1-minute cycling of Mode III from 7600/7700 to desired channel.

| Mode I | Mode III |
|---|---|
| 60 — Aux. Rec. (ADF) channel | Channel usable (0100-2000) and 2100 = Guard |
| 61 — No NAVAID(s). Rec. on channel | |
| 62 — TACAN/JPALS ok. Rec. on channel | |

## 4.8 TRANSIENT AIRCRAFT

The controlling agency shall advise the aircraft of BRC and/or all course changes.

Transient aircraft approaching the ship for landing shall contact AATCC at least 25 miles out or when “feet wet.”

## 4.9 LOST AIRCRAFT PROCEDURE

When the position of an aircraft is in doubt, the controller shall immediately commence the following procedure:

1. Attempt to obtain radio or radar contact. Utilize relay aircraft to attempt radio contact on circuit in use and guard frequencies. Continue to send information in the blind, and search all IFF modes. Commence communication search and monitor guard channels (243.0, 121.5, and 40.50) for emergency aircraft calls.

2. Inform the Officer Conducting Exercise (OCE)/OTC.

3. Keep estimate of aircraft’s fuel state.

4. Check weather and clear airspace for emergency marshal as required.

5. Check to determine if NAVAIDs are operable. If NAVAIDs are inoperable, alert the command for the possible use of other aids to lost aircraft such as search aircraft, black smoke, vertical searchlights, antiaircraft bursts, starshells, fire control tracking balloons, energized prebriefed sonobuoy channel, and other NAVAIDs.

6. If contact (communications or radar) cannot be regained before expiration of the aircraft’s last known fuel state, activate the command SAR plan.

Once contact is regained:

1. Check fuel state.

2. Vector aircraft to ship or divert as appropriate.

3. Vector aircraft for escort if necessary.

4. Maintain regaining contact track of aircraft.

5. If communications are unsatisfactory, utilize relay aircraft or have lost aircraft gain altitude if able.

# CHAPTER 5

# General Aviation Procedures

## 5.1 OPERATIONAL PROCEDURES RESPONSIBILITIES

### 5.1.1 General

Positive communications shall be maintained among flight deck, AATCC, PriFly, and the bridge during all phases of flight operations to ensure that the Officer Of the Deck (OOD) controls the ship so that wind and deck motion remain within the prescribed envelope. During all phases of air operations, the OOD shall inform PriFly and AATCC prior to changing BRC/speed and provide expected BRC/speed.

The ship must be maintained on a steady course and speed during rotor engagement or disengagement, taxiing, and launch or recovery operations. Deck tilt, centrifugal force, or rapidly changing wind direction or velocity affects the ability to control aircraft aerodynamically and may cause rollover. Permission must be obtained prior to the movement, engagement, disengagement, launch, or recovery of any aircraft. As the representative of the ship's commanding officer, the OOD and the Air Officer have supervisory responsibility for safe operations at all times.

### 5.1.2 Time Schedule

All flight preparations shall be completed in sufficient time to permit pilots to conduct preflight inspections of their aircraft prior to scheduled launch time. Every effort shall be made to prevent delays in the launch cycle.

### 5.1.3 Flight Quarters

Flight quarters shall be set in time for all personnel to man stations and to complete preparations prior to flight operations. The following stations shall report to the OOD or Air Officer (as appropriate) when flight quarters are set:

1. PriFly.
2. Hangar deck.
3. Flight deck.
4. Aviation fuels.
5. AATCC.
6. Rescue boat detail.
7. Crash crew and firefighters.
8. CIC.
9. Medical crew.

### 5.1.4 Primary Flight Control

PriFly provides recovery/launch and operational control of aircraft while on ship and within the ship's control zone (see Figure 4-1). It interfaces with AATCC in control of airborne aircraft with the CCO in integrating assault elements with helicopters on the flight deck and, with Well Deck Control for deconfliction of flight and well deck operations. "On ship" control of aircraft includes spotting, maintenance, fueling/defueling, arming/dearming, movement, stowage, and handling of aircraft on the flight and hangar decks.

### 5.1.5 Communications

PriFly is equipped with numerous communications terminals, both internal and external. Internal communications systems link PriFly with other ship control spaces, and internal radio systems provide communications control of personnel on the flight deck. Additionally, PriFly controls the 5 MC (flight deck announcing system). Communications equipment provides PriFly with both radio and visual (Aldis lamp) links to aircraft under PriFly control. A sample launch sequence with associated flight deck events and PriFly/Flight Deck announcements is contained in Appendix C. Refer to Paragraph 4.6.1 for control of other communications nets.

### 5.1.6 Flight Deck Lighting and Optical Landing Aids

PriFly has control of optical landing aids and flight deck lighting.

### 5.1.7 SAR Readiness Conditions

Flightcrews assigned the following alert conditions shall be called away early enough to permit normal preflight inspection, start, warmup, and completion of the takeoff check by the time specified in the air plan for the alert condition to become effective. After the pilot declares the helicopter ready for flight, it shall be placed in the appropriate alert condition. Mission-required personnel assigned the following alert conditions shall have all necessary equipment issued and be prepared for departure in accordance with the appropriate alert condition.

#### 5.1.7.1 Condition I/Alert 5

The helicopter shall be spotted for immediate launch with rotor blades spread, aircrew and mission-required personnel in the helicopter, starting equipment plugged in, and with the LSE and starting crew member and ordnance personnel ready for launch in all respects. When the word is passed to “Standby for launch,” engines shall be started without further instructions; however, launch shall be positively controlled from PriFly. Aircraft should be airborne within 5 minutes of order to launch.

#### 5.1.7.2 Condition II/Alert 15

The same conditions apply as for Condition I, except that flightcrews and mission-required personnel are not required to be in the helicopter, and rotor blades may be folded or tied down. Flightcrews and mission-required personnel shall be on immediate call, if rotor blades are folded, the blades shall be run through a unfold/fold cycle to ensure operability. Aircraft should be airborne within 15 minutes of order to launch.

#### 5.1.7.3 Condition III/Alert 30

Main rotor blades may be folded and the helicopter need not be in position for immediate launch; however, it must be parked so as to allow direct access to a suitable launch spot. A towbar shall be attached to the helicopter and a specific LSE, tractor driver, handling crew, and starting crew member shall be designated and assigned to each helicopter. These personnel must be thoroughly briefed, so that when the order is given to prepare to launch, the helicopter can be safely and expeditiously moved into position and readied for launch. Flightcrews shall be in the ready rooms or working spaces, in flight gear, and prebriefed for the launch. Mission-required personnel shall be in a designated location with all necessary gear. Aircraft should be airborne within 30 minutes of order to launch.

#### 5.1.7.4 Condition IV/Alert 60

The condition of the helicopter is similar to Condition III, except that minor maintenance may be performed if no restoration delay is involved. The aircrew and mission-required personnel shall be designated and available. Aircraft should be airborne within 60 minutes of order to launch.

### 5.1.8 Fixed-Wing Readiness Conditions

Pilots shall be called away early enough to permit a normal preflight inspection, start, warmup, and completion of takeoff checks for Conditions I and II, by the time specified in the air plan for the required readiness condition. The aircraft shall be placed in the appropriate readiness condition after the pilot declares it ready for flight. The four readiness conditions are discussed in the following paragraphs.

**Note**

During hot weather, the poor cockpit conditioning system of the AV-8B during ground operations can induce dangerous levels of heat stress and crew fatigue, significantly limiting the amount of time pilots can safely maintain readiness conditions I and II. Refer to AV-8B NTTP and NAVAIR 00-80T-111 for applicable time limitations.

#### 5.1.8.1 Condition I/Alert 5

The aircraft shall be spotted in the launch position or in a position that affords a clear route to the launch position. The aircraft shall be secured by the initial four-point tiedown, unless otherwise directed by the ACHO. Any necessary equipment shall be plugged in. An aircraft director, starting crew member, plane captain, required aircraft handlers, and ordnance personnel shall stand by the aircraft. The aircraft's pilot shall be ready for flight in all respects, with parachutes, safety belts, shoulder harnesses, radio leads, and other personal equipment attached and adjusted as in flight. The launching crew shall be on station and alert. Launching accessories shall be on deck and ready for immediate use. When directed, the Air Officer shall pass the order over the flight deck announcing system to launch Condition I aircraft. Aircraft and flight deck crews shall, without awaiting further instructions, go through the normal start and prelaunch procedures. The LSO shall man the tower and the Air Officer shall have all recovery aids energized. As preparations are made for the launch, the Air Officer shall relay wind information to the launching officer and an initial vector, if available, to the pilot. The Air Officer shall obtain permission from the bridge to launch and, when all conditions are satisfactory, turn on the green rotating beacon and clear the launch officer to launch.

#### 5.1.8.2 Condition II/Alert 15

All provisions for Condition I apply except that flightcrews are not required in the aircraft unless required to meet Alert 15 timeline. They shall, however, be on the flight deck near their aircraft or inside the island structure at the flight deck level.

#### 5.1.8.3 Condition III/Alert 30

Flightcrews shall be in full flight gear, briefed, and standing by in the ready rooms or working spaces. Starting equipment shall be immediately available and flight deck and launching crews shall be standing by near the stations.

#### 5.1.8.4 Condition IV/Alert 60

Similar to Condition III, except that minor maintenance may be performed on the aircraft if no delay in launch is involved.

### 5.1.9 USMC Assault Support Readiness Conditions

Refer to NTTP 3-22.5 ASTACSOP.

### 5.1.10 Responsibilities of Air Officer and Squadron Operations Duty Officer

#### 5.1.10.1 Air Officer

The Air Officer is responsible to the ship's commanding officer for activities in support of flight operations on the flight deck and hangar deck. The Air Officer or a qualified assistant shall be in PriFly during flight quarters to control all evolutions involving aircraft. The Air Officer shall confirm aircraft assignments with AATCC and the squadron maintenance controller/liaison officer prior to respotting the flight/hangar decks for launch. In addition to the ship's air plan, the Air Officer shall also maintain an up-to-date copy of the squadron flight schedule in PriFly. During Case III/night operations, both PriFly positions shall be manned. One of these positions shall be manned by either the Air Officer or assistant Air Officer.

#### 5.1.10.2 Squadron Operations Duty Officer

The squadron Operations Duty Officer (ODO) is responsible to the squadron operations officer for the coordination and execution of the flight schedule. During flight quarters, the ODO shall remain in the squadron ready room and monitor applicable communications circuits. The ODO shall keep AATCC and PriFly (if necessary) notified of any changes that may affect launch or recovery operations.

## 5.2 FLIGHT DECK PROCEDURES

### 5.2.1 Flight Deck Description

The flight deck is marked with nine spots (see Figure 5-1), and is divided into two separate landing areas. When operating aircraft, the forward area consists of spots 1 through 5, while the aft area consists of spots 6 through 9. The two landing areas are controlled separately by rotary beacon lights or flags from PriFly (Figures 5-3 and 5-4). Compatible spotting arrangements for USN/USMC/USA/USAF/USCG aircraft are contained in Appendix E. A typical landing spot is illustrated in Figure 5-5. In addition, each spot is assigned an LSE/director who wears a helmet equipped with a transmitter/receiver unit providing direct communication with PriFly and flight deck control.

There are three distinct safe parking lines on the flight deck. Each of these lines ensure a minimum distance from aircraft operations during a specific regime of flight. These three separate flight regimes are: fixed wing operations, rotary wing, V-22 vertical launch and recovery operations from designated landing spots, and V-22 STO/taxi operations. These safe parking lines are distinctly marked as follows:

> The alternating red and white Fixed Wing Safe Parking Line applies to Fixed Wing takeoff and vertical landing operations and has no direct relationship to V-22 or H-53 operations. The Fixed Wing Safe Parking Line also applies to H-60, H-47, H-58, H-64, H-6, and H-1 operations on port side landing spots.
>
> The solid yellow V-22/H-53 Safe Parking Lines associated with port side spots provide clearance for vertical launch and recovery operations. Spot 6 is the only port side vertical landing area without a solid yellow Safe Parking Line as there is no ability to stow aircraft adjacent to spot 6.
>
> The alternating yellow and white V-22 STO/Taxi Safe Parking Line provides clearance for V-22 STO and taxi operations in the forward port side landing area.

### 5.2.2 General Flight Deck Safety

The ship's commanding officer has responsibility at all times for the safety of embarked aircraft and personnel. The commanding officer/OIC of the aircraft squadron/detachment and the pilots of individual aircraft are directly responsible for the safety of assigned aircraft and personnel.

**Note**

In questionable circumstances, the senior naval aviator present from the embarked squadron/detachment shall make the final determination concerning the safety of aircraft and aircrew.

The embarked squadron commanding officer, Air Officer, and the OIC of the aircraft squadron/detachment shall evaluate the hazards involved in all phases of shipboard flight operations and develop appropriate safety measures. All personnel shall be trained in safe operating procedures before flight operations commence and shall ensure that hazards and unsafe practices are reported to the Air Officer.

**WARNING**

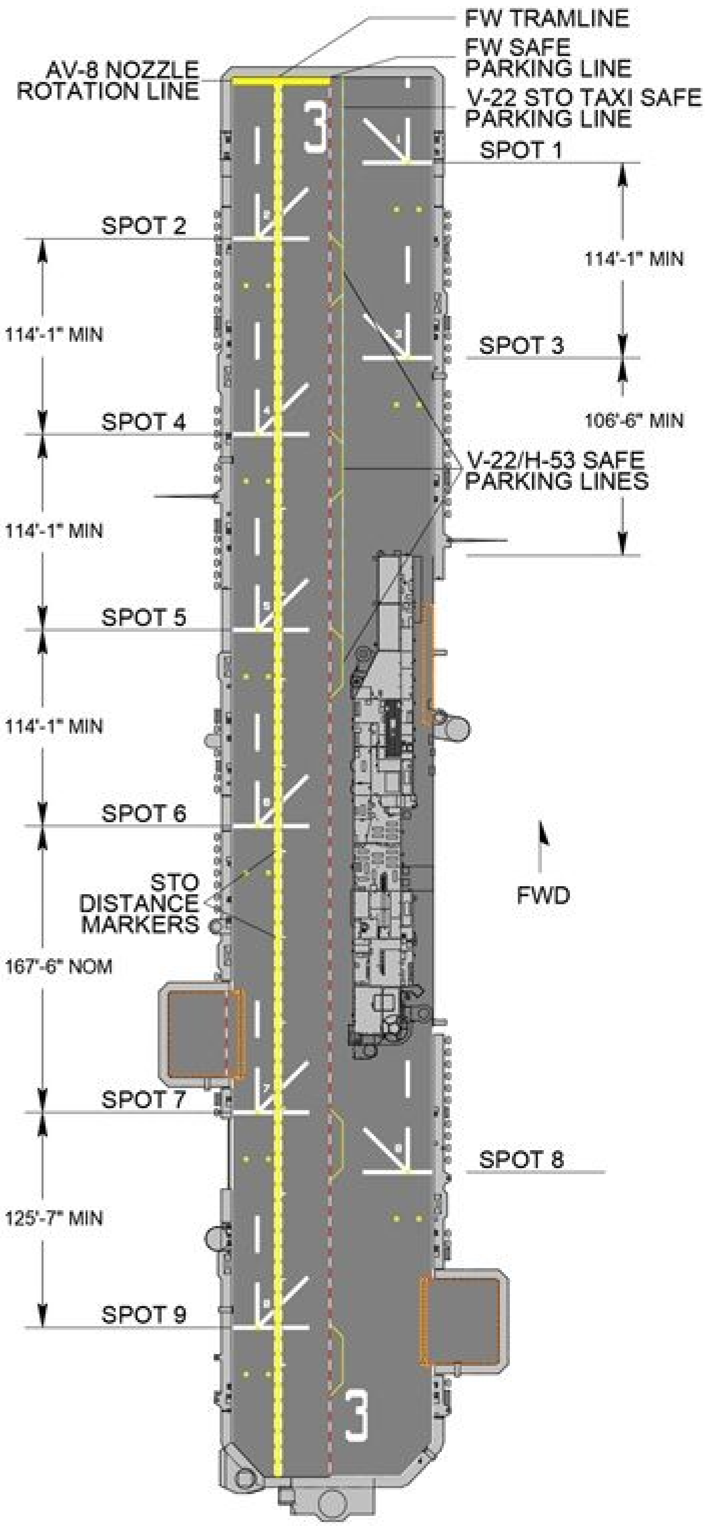
The presence of high winds, high noise levels, fire hazards, flying objects, turning rotors, taxiing aircraft, intake suction, and jet blast make safety consciousness imperative.

During flight operations, only those personnel whose presence is required shall be allowed on the flight deck. All others shall remain clear of the flight deck, catwalks, and gun tub areas. Personnel may view flight operations only from an area designated by the commanding officer.

**WARNING**

- Failure to utilize the appropriate safe parking line may result in insufficient clearance resulting in aircraft damage or personnel injury.
- Should a missile threat be encountered in a hostile environment, Nulka can dispense into airborne aircraft in proximity to the ship with little or no warning, resulting in aircraft damage or injury to aircrew.
- The storage of cargo or equipment greater than 8 feet in height along the port side of the island may result in insufficient clearance from operations on spot 6 resulting in aircraft damage or personal injury.

Figure 5-1. LHD Typical Arrangement of Helicopter Spots and AV-8B Markings (without F-35B modifications)




NOTES:

1. V-22 and H-53 have a clearance of less than 15’ when other aircraft or equipment are stowed on the starboard side of all Safe Parking Lines. Aircraft and equipment should be stowed as far starboard as possible during flight operations to maximize lateral separation.
   a. On Spots 5 and 6, V-22 separation from the Island is 13’5”
   b. Clearance for a V-22 on Spot 7 to an H-53 on Spot 8 is 14’0”

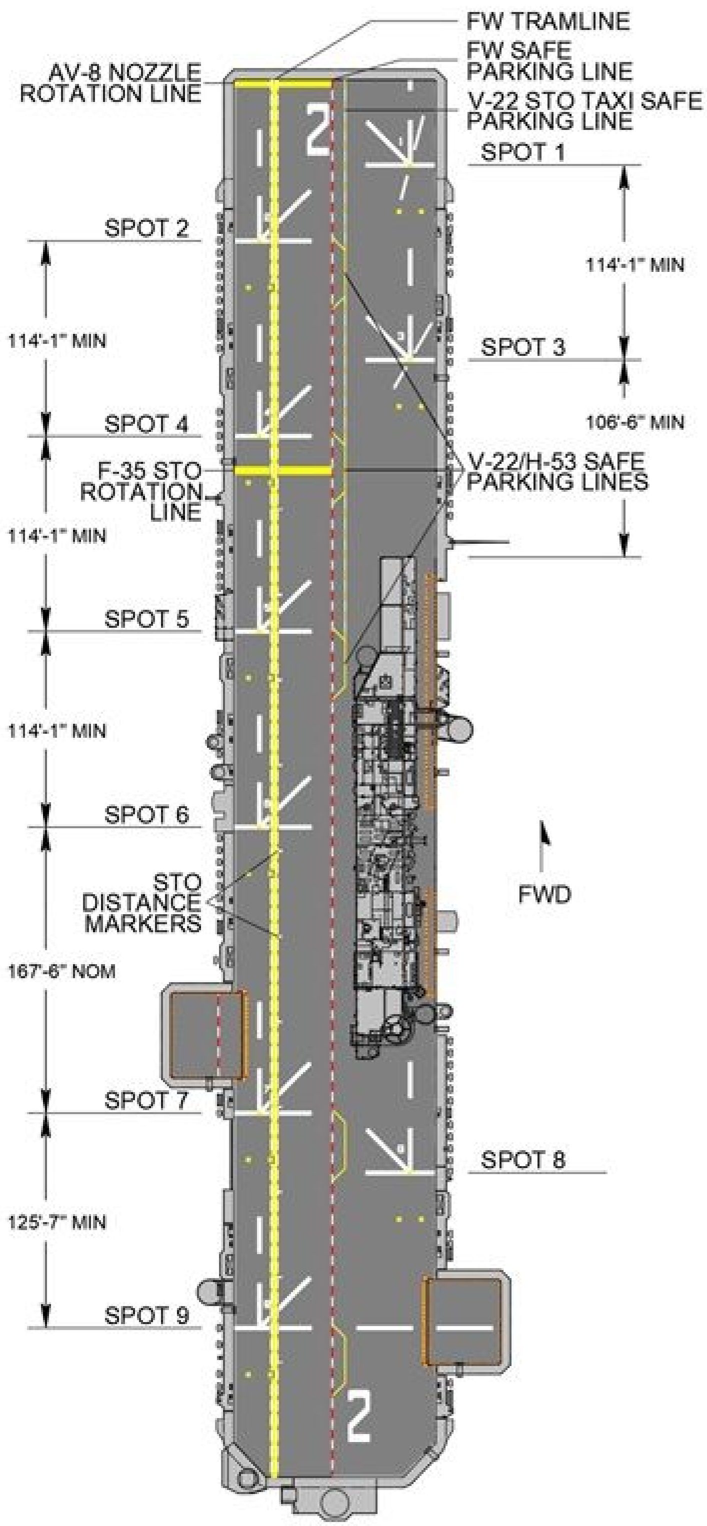
2. V-22 STO launches will use the helicopter spot longitudinal line-up line as a STO line. V-22 aircraft should position themselves on Spot 4 to commence their STO launches.

3. When properly spotted on the port-side spots, spread/turning V-22 have 7’6” of clearance from the V-22 STO Taxi Safe Parking Line. The most starboard tie-down positions should be utilized to maximize clearance with V-22 rotors.

4. The storage of cargo or equipment taller than 8 feet is prohibited within an area bounded by the fixed wing safe parking line, aft edge of the spot 5 V-22/H-53 safe parking line, the port side of the island, and the aft port corner of the island. See Fig 5-6.

5. H-53 fuel probes may encroach into V-22/H-53 Safe Parking lines but may not extend beyond the Fixed Wing Safe Parking Line.

Figure 5-2. LHA 6 Type and LHD Typical Arrangement of Helicopter Spots, AV-8B and F-35B Markings




NOTES:

1. V-22 and H-53 have a clearance of less than 15' when other aircraft or equipment are stowed on the starboard side of all Safe Parking Lines. Aircraft and equipment should be stowed as far starboard as possible during flight operations to maximize lateral separation.
   a. On Spots 5 and 6, V-22 separation from the Island is 13'5"
   b. Clearance for a V-22 on Spot 7 to an H-53 on Spot 8 is 14'0"

2. V-22 STO launches will use the helicopter spot longitudinal line-up line as a STO line. V-22 aircraft should position themselves on Spot 4 to commence their STO launches.

3. When properly spotted on the port-side spots, spread/turning V-22 have 7'6" of clearance from the V-22 STO Taxi Safe Parking Line. The most starboard tie-down positions should be utilized to maximize clearance with V-22 rotors.

4. The storage of cargo or equipment taller than 8 feet is prohibited within an area bounded by the fixed wing safe parking line, aft edge of the spot 5 V-22/H-53 safe parking line, the port side of the island, and the aft port corner of the island. See Fig 5-6.

5. H-53 fuel probes may encroach into V-22/H-53 Safe Parking lines but may not extend beyond the Fixed Wing Safe Parking Line.

Figure 5-3. Command and Display Signals

| EVOLUTION | COMMAND | DISPLAY | MEANING (HELO) | MEANING (AV-8B/F-35B) |
|---|---|---|---|---|
| 1. Prepare to start engines: Red Deck Aft/Fwd. | Check chocks, chains, tiedowns, fire bottles, and all loose gear about the flight decks. Helmets buckled, goggles down, start Auxiliary Power Plant (H-53) (APP)/GTS on LSE/director signals. | Red signal in flight deck area. | Verify starting wind limitations chocks and tiedowns in place. Boots removed and stowed. Secure all loose gear. Man Mobile Firefighting Vehicle (MFFV) | Intake blanks clear GTS wind limits met, chocks, tiedowns in place, loose gear secured. Man Mobile Firefighting Vehicle (MFFV) |
| 2. Start engines: | Start engines. | Red signal in flight deck area. | Authority for responsible flight deck personnel to signal for starting engines. Ship not ready for flight operations. | |
| 3. Engage / disengage rotors. | Stand clear of rotors (20-second pause) engage/disengage rotors. | Amber signal in flight deck area. | Ship is ready for the pilot to engage rotor. Authority for responsible flight deck personnel to signal for engaging rotors when the immediate area is cleared. Ship not ready for flight operations. | Squadron personnel conduct poststart checks (i.e., controls) clear exhaust areas. |
| 4. AV-8 Engine Run-Up. | Cleared Engine Run-Ups A/C__. | | | AV-8 launch officer conduct water activation and aircraft configuration check. |
| 5. Removal of tiedowns: None. | Remove all tiedowns. | Not applicable. **Note** EMCON (Red, Green, Red). | Remove tiedowns from aircraft and show to pilot, LSE points to tiedowns and shows one finger to the pilot for each tiedown removed. | |
| 6. Aircraft arm/de-arm: Amber Deck Aft/Fwd. | Arm/dearm aircraft. | Amber/Green. | LSE turns aircraft over to arm/dearm supervisor. | |
| 7. V-22/AV-8B/F-35B Taxi. | Taxi. | Any signal in flight deck area. | Authority for responsible flight deck personnel to taxi V-22/AV-8B/F-35B when pilot is ready and tiedowns and chocks have been removed. | |
| 8. Launch: Green Deck Aft/Fwd. | Launch aircraft. | Green signal in flight deck area. | Ship is ready in all respects for flight operation, aircraft is in safe configuration for launch. Authority for responsible flight deck personnel to launch aircraft when pilot is ready and tiedowns and chocks have been removed. | |
| 9. Aircraft approaching: Red Deck Aft/Fwd. | Standby to recover aircraft, spot ____. | Red signal in flight deck area. | Prepare designated landing area to land aircraft. Ship not ready to recover aircraft. | |

Figure 5-3. Command and Display Signals (cont.)

| EVOLUTION | COMMAND | DISPLAY | MEANING (HELO) | MEANING (AV-8B/F-35B) |
|---|---|---|---|---|
| 10. Recover: Green Deck Aft/Fwd. | Land aircraft. | Green signal in flight deck area. | Ship is ready in all respects to land aircraft. | |

**Note**

- Flight deck rotating beacon signals are for PriFly control of flight deck operations only. These lights are not to be interpreted by pilots as clearance/denial for any evolution.
- Tiltrotors may engage or disengage their rotors in a turn within the engagement wind envelope established in V-22 NATOPS.

Figure 5-4. Flag Hoist Signals

| EVOLUTION | FLAG DISPLAY | MEANING |
|---|---|---|
| Setting of flight quarters. | HOTEL/FOXTROT flag at the dip (as appropriate). | Ship ready to conduct flight operations when wind conditions are suitable. |
| Ready to conduct flight operations. | HOTEL/FOXTROT close up (as appropriate). | Ready to conduct or conducting flight operations. |
| A delay or interruption of the evolution. | HOTEL/FOXTROT at the dip (as appropriate). | Flight operations temporarily delayed. |
| No flight operations being conducted. | HOTEL/FOXTROT flag hauled down (as appropriate). | No flight operations being conducted. |

**HOTEL FLAG (HELO OPS)** **FOXTROT FLAG (FIXED-WING OR MIXED OPS)**


**Note**

HOTEL/FOXTROT flag is displayed just forward and above PriFly.

Figure 5-5. Helicopter/Tiltrotor Landing Spot Diagram (Typical)

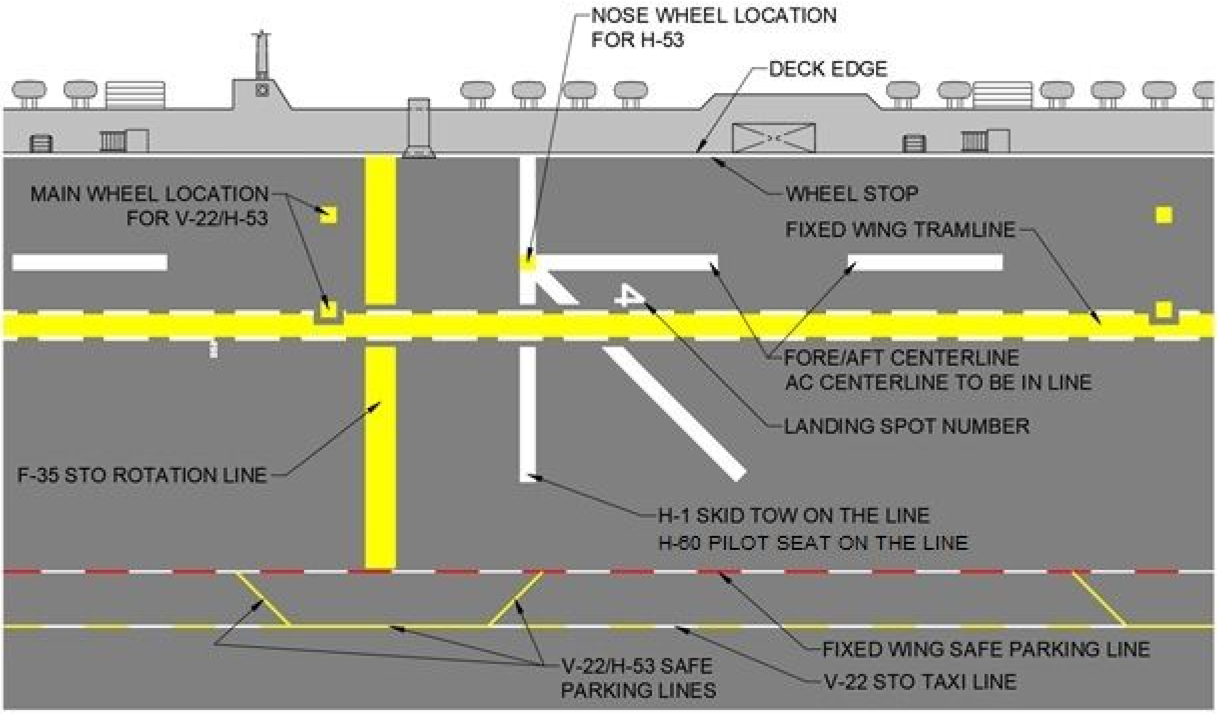
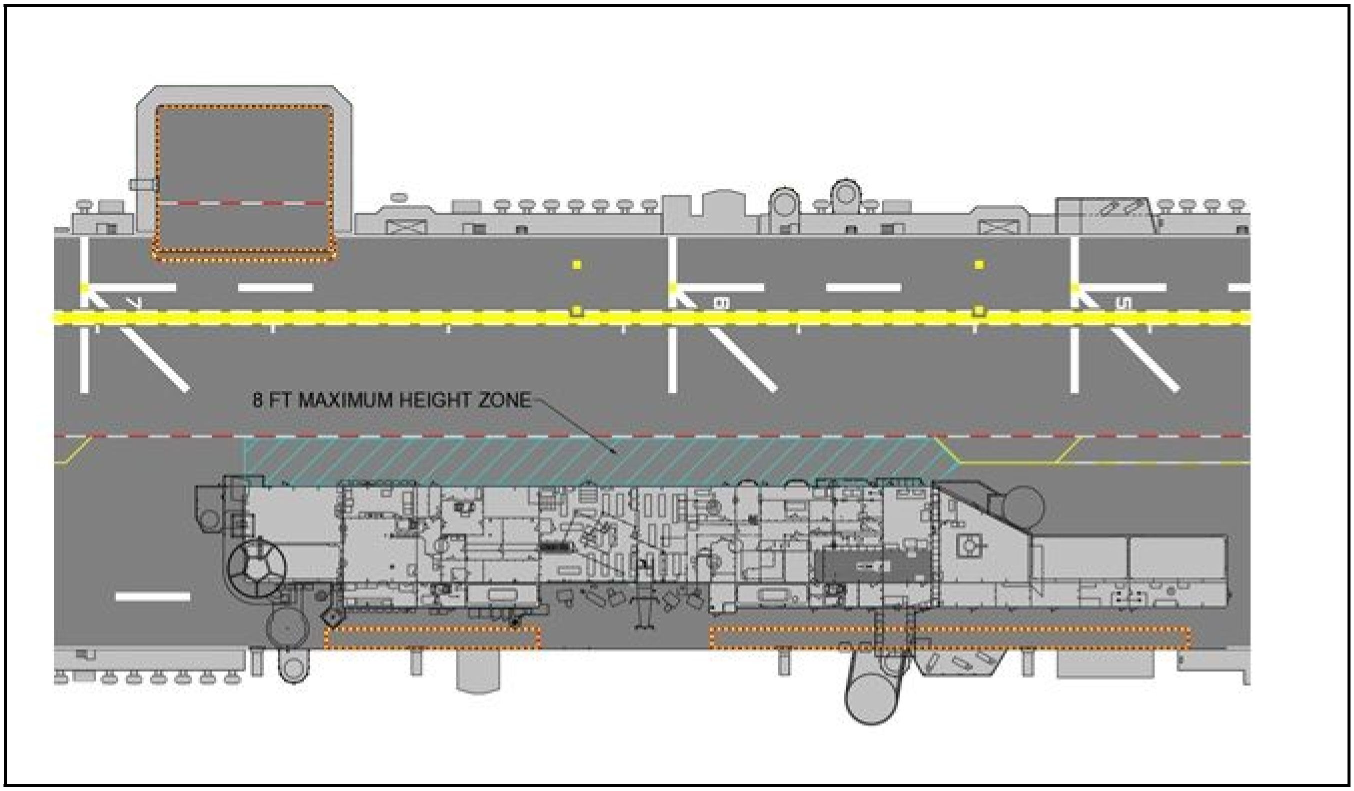


Figure 5-6. Cargo/Equipment 8 FT Maximum Height Zone




Personnel assigned duties on the flight deck shall wear appropriate safety helmets, sound suppressors, safety goggles, flight deck safety shoes, long sleeve shirts/jerseys, and lifevest. Flight quarters clothing shall conform to the colors and symbols prescribed in Appendix D.

While flight operations are being conducted, personnel on exposed decks and catwalks shall remove all loose items of clothing and equipment, including hats, except for approved, properly fastened, safety helmets.

Personnel on the flight deck shall be trained to take cover immediately on command of the Flight Deck LCPO, Air Officer, or launch officer.

Personnel working near an aircraft shall observe the aircraft carefully for any signs of malfunction, such as smoke, oil, hydraulic leak, and immediately report such malfunctions to the nearest yellow shirt, Flight Deck LCPO, Air Officer, or launch officer.

Crewmembers, passengers, and troops returning from flight shall expeditiously clear the flight deck and the vicinity of the island structure exposed to flight operations. All passengers and troops shall be escorted to and from aircraft by qualified personnel.

**WARNING**

Smoking or chewing tobacco shall never be permitted on the flight deck, hangar deck, catwalks, elevators, or weather decks. Matches and cigarette lighters shall never be used in compartments where fuel fumes may be present.

Dawn, dusk, and night operations increase the hazards to personnel on the flight decks, and greater vigilance is required during these periods.

When aircraft are serviced, especially at night, extreme care shall be taken to prevent overfilling of fuel tanks and spilling of oil or hydraulic fluid. Oil, grease, hydraulic fluid, and spilled fuel shall be removed from the flight deck immediately.

Care shall be used in approaching elevator openings, particularly on the windward side. No person shall attempt to get on or off an elevator once the elevator operator has raised the elevator stanchions. No one shall lean on the elevator guard rails at any across cargo elevator openings at all times when main hatches are open and cargo is not being moved into/out of the elevator.

Crash crew and/or organized fire parties are responsible for responding to aircraft crashes and fires. All other personnel shall remain clear of the area in which the fire or crash has occurred, unless specifically requested to assist in combating the fire or clearing the deck. In case of fire, all available personnel shall aid in handling hoses and personnel casualties. Special assistance shall normally be requested over the 5 MC or 1 MC.

Care shall be exercised in spotting or parking aircraft in the vicinity of energized antennas. Sufficient voltage may be induced in the airframe to create a safety hazard.

No aircraft shall be spotted so as to extend over a gun tub or missile launcher.

**CAUTION**

- HF transmissions may cause damage to nonorganic/joint service helicopter automatic blade fold systems including inadvertent activation of folding mechanisms. The ship's HERO bill shall be reviewed prior to embarkation of nonorganic/joint service helicopters.
- No aircraft shall be closer than 30 feet to any gun mount during live fire exercises. Damage to aircraft skin, windows, and ramps may result from overpressurization.

### 5.2.3 Foreign Object Damage Hazard

All deck areas, and particularly the flight deck, shall be inspected prior to, and monitored throughout, flight operations to ensure that they are clear of foreign objects, such as rags, pieces of paper, line, caps, nuts, bolts, flight deck and nonskid debris, etc., that can be caught by air currents and subsequently cause damage to aircraft or injure personnel.

Measures to minimize liquid FOD, including the use of drip pans wherever practicable, should be taken at all times. Spills and leaks shall be cleaned immediately.

**WARNING**

Liquid FOD, such as oil or hydraulic fluid, can cause the deck to become slippery, jeopardizing the safety of personnel working or moving aircraft on the flight deck and hangar deck.

Dumping of trash shall be secured prior to flight operations and not resumed until flight operations are completed.

**WARNING**

- Dumping of trash during flight operations creates a serious FOD hazard.
- Ingestion of deteriorating nonskid can cause catastrophic FOD damage.

## 5.3 PREFLIGHT INSPECTIONS

When aircraft are still awaiting deck spotting, preflight inspection shall be completed to the maximum extent possible. All preflights should be completed 30 minutes prior to launch time and pilots shall be strapped in the aircraft with the prestart checklist completed as far as possible.

Maintenance on, or preflight of, any portion of an aircraft that extends beyond the ship's deck edge is prohibited. All aircrew and maintenance personnel shall wear a safety cranial or flight helmet when climbing on top of aircraft. Flotation gear shall be worn whenever the aircraft is on the flight deck.

## 5.4 PRELAUNCH PROCEDURES

### 5.4.1 Launch Responsibilities

The upwind mast-mounted anemometer should be used for wind speed and direction (starboard sensor for starboard winds from 0 to 180 degrees, and port sensor for port winds from 180 to 360 degrees). Starting, engagement, launch, and recovery wind envelopes shall be available for use by the OOD and Air Officer during flight operations.

The OOD shall set flight quarters in time for all personnel to man stations and complete preparations prior to flight.

Communications circuits shall be manned as appropriate.

The OOD shall ensure that the rescue boat is fully prepared and that the boat crew is detailed and available for launch.

The Air Officer shall ensure that obstructions such as weapons, antennas, cranes, flagstaffs, and lifelines are lowered, trained clear, or unrigged.

Antennas shall be deenergized prior to lowering or unrigging.

Prior to starting engines, the ACHO shall ensure a complete FOD walkdown is conducted of the entire flight deck, all weather decks, and catwalks.

The Air Officer shall clear the flight deck of all unnecessary personnel and shall require all flight deck personnel utilize appropriate flight deck clothing and equipment.

The Flight Deck LCPO shall ensure that mobile crash and firefighting equipment is manned and ready.

The OOD shall display HOTEL/FOXTROT at the dip and a red deck signal to PriFly (Figure 5-4).

The OOD shall maneuver the ship to obtain favorable wind conditions. This is intended to mean within the established wind limitations. However, whenever possible, optimum winds shall be provided. Wherever environmental conditions or ship motion dictates, these wind limitations shall be reduced to provide safe engine start, engagement/disengagement, launch, and recovery winds. Squadron/detachment commanding officer/OICs in charge shall ensure limitations more restrictive than that established by NATOPS are discussed and agreed upon with ship's commanding officer.

**WARNING**

Starting the aircraft engine with a tailwind may introduce HGI into the IPP intake resulting in an abnormal engine start or engine fire. The risk of a tailpipe fire increases with a greater tailwind.

### 5.4.2 Launch Preparation

When spotting an aircraft for launch, the LSE/director/crewchief/plane captain shall ensure that the parking brakes are set, wheels are chocked, tail or nosegear locked (as applicable), and safe rotor/wing clearance exists. Chains shall be attached in accordance with applicable NATOPS or maintenance instruction manuals. Engine/GTS/APP/APU starts, blade spread, and rotor engagement shall not be accomplished in wind conditions exceeding individual aircraft NATOPS limitations.

Whenever possible, aircraft should be spotted with first events on the bow in sequential flight order.

Relative wind direction and velocity shall be passed to the pilot by prearranged method (5 MC, hand signal, radio) prior to engine start, rotor blade spreading or engagement, and immediately prior to launch.

**WARNING**

Starting the aircraft engine with a tailwind may introduce HGI into the IPP intake resulting in an abnormal engine start or engine fire. The risk of a tailpipe fire increases with a greater tailwind.

The LSE/director shall receive clearance from the Air Officer prior to starting engines or engaging rotors.

### 5.4.3 Wind and Deck Limitations

Safe aircraft operations require strict adherence to prescribed wind and deck limitations. Commanding officers may establish more restrictive limitations.

**Note**

For specific wind and deck limitations, see Appendix A or shipboard operating bulletin.

### 5.4.4 APU/APP/GTS/IPP Start

When aircraft are spotted on the flight deck, pilots shall proceed with the prestart procedures and signal the LSE/director when ready to start the APU/APP/GTS/IPP.

The LSE/director shall request clearance for APU/APP/GTS/IPP start from the Air Officer in PriFly via the flight deck supervisor. PriFly shall display a red rotating beacon and announce the following over the 5 MC: "Check chocks, tiedowns, fire bottles, and all loose gear about the flight deck, helmets buckled, goggles down, start APU/APP/GTS/IPP on LSE/director signal."

The LSE/director shall relay the clearance to the pilot before APU/APP/GTS/IPP start can be initiated. APU/APP/GTS/IPP starts may be requested while aircraft are in the parking area (slash). Radios shall be turned on and set to land/launch frequency as soon as practicable after APU/APP/GTS/IPP is started. The MFFV shall be manned for all APU/APP/GTS/IPP or main engine starts to include maintenance turns and engine wash/rinse procedures.

### 5.4.5 Engine Starting

When ready to start engines, the pilot shall request clearance from the LSE/director by a raised hand displaying one or two fingers to indicate the desired engine to start. The LSE/director shall request clearance from PriFly via the flight deck supervisor. PriFly shall ensure that winds are within limits for start/engagements, display a red rotating beacon (amber for skid-configured helicopters and V-22), and then announce clearance for engine start over the 5 MC circuit. The pilot shall not start engines until receiving signal from the LSE/director.

**WARNING**

Starting the aircraft engine with a tailwind may introduce HGI into the IPP intake resulting in an abnormal engine start or engine fire. The risk of a tailpipe fire increases with a greater tailwind.

### 5.4.6 Internal Cargo and Troops (Helicopter and Tiltrotor)

Internal cargo normally moves to the flight deck staging areas via cargo elevators near the island, fixed vehicle ramps, or aircraft elevators. Loading is directed by the combat cargo officer. Internal loading will vary according to the type aircraft, type of cargo, and deck load. The combat cargo officer shall ensure that pilots are given notification of any changes to prebriefed cargo loads.

Troops are escorted by combat cargo personnel (white shirts) to the flight deck via designated troop debark stations/shelters as directed by the combat cargo officer. Clearance shall be requested from the LSE prior to loading/unloading troops while aircraft are turning.

### 5.4.7 Aircraft with a Maintenance Malfunction/Discrepancy

Disposition of an aircraft with a maintenance malfunction/discrepancy shall be in accordance with the prelaunch briefing. Except in case of emergency, the aircraft shall be shut down only on signal from the LSE/director. Pilots shall remain in downed aircraft until the crewchief/plane captain is on hand and ready to man the cockpit (not applicable to skid-configured helicopters).

An aircraft with a maintenance malfunction on deck shall be shut down expeditiously upon signal from the LSE/director. The maintenance officer or representative shall inform the Flight Deck LCPO of the nature of the trouble and also give an estimate of the time needed for repair. If the maintenance required is to be for a long duration, the aircraft will normally be removed from the spot. If repairs can be accomplished on deck, and succeeding launches will not be delayed, the aircraft shall be launched when the discrepancy is resolved.

## 5.5 LAUNCH PROCEDURES

### 5.5.1 General Launch Procedures

When all prelaunch checks are completed and the pilot is ready for launch, the pilot shall give the LSE/launch officer a thumbs-up signal and report aircraft status, fuel state, and souls on board to PriFly. The LSE/director shall signal the flight deck supervisor and flight deck supervisor then notifies PriFly that all aircraft are ready for launch. PriFly shall request a green deck from the bridge. When the ship is on a steady course, the OOD shall order HOTEL/FOXTROT flag closeup, and give PriFly a green deck signal. The Air Officer shall ensure that proper wind conditions exist for the launch in accordance with Appendix A.

Launch of helicopters while the ship is in a turn should be attempted only when authorized by the ship's commanding officer or designated representative. Anticipated wind parameters and ship's heel shall be communicated to the helicopter aircraft commander prior to the execution of the turn.

The Air Officer shall direct the flight deck supervisor to have chocks and tiedowns removed. The flight deck supervisor shall then direct the LSE/director to remove tiedowns and chocks. When removing tiedowns from helicopters, the tiedowns shall be removed aft to forward. The mainmount tiedowns shall be removed simultaneously. On signal from the LSE/director each chockman (blue shirt) shall remove all tiedowns and chocks from their side of the aircraft and then proceed to the LSE/director and face the pilots.

Tiedowns and chocks shall be carried within view of the pilots and shown to and acknowledged by the pilots. The LSE/Director shall point to the chocks and tiedowns removed, followed by the showing of one finger for each tiedown and chock removed to the pilot.

When PriFly is satisfied that all conditions are ready for safe launch, the deck condition light(s) shall be set to green and the launch commenced.

Launch and recovery of other aircraft when a V-22 has rotors turning on deck is authorized as shown in Appendix E, Figure E-2, V-22 launch and recovery operations should not be conducted from spots immediately behind unsecured light or medium lift tail rotor aircraft. If V-22 launch and recovery operations are required from spots immediately behind unsecured light or medium lift tail rotor aircraft, consideration should be given to securing the aircraft with initial (four-point) tiedowns and increasing the wind over the deck.

Helicopters landing behind engaged tail rotor aircraft shall not conduct cross-cockpit takeoffs or landings for LSE safety.

**WARNING**

- Rotor downwash created by the H-53 and the V-22 is greater than that produced by any other embarked helicopter. This downwash is sufficient to damage spread helicopter rotor blades and blow aircraft chocks, tiedown chains, and towbars about the deck or overboard, and cause personnel injury or death.
- H-53 and V-22 launch and recovery operations directly behind any unsecured light to medium lift tail rotor helicopter may cause uncommanded yaw of the forward helicopter due to H-53 and V-22 downwash resulting in possible aircraft damage and/or personnel injury or death.

**CAUTION**

- When launching/recovering, damage from downwash to aircraft stowed abeam the spot in use may occur even when folded, crutched, and properly secured.
- Combination of relative winds and rotor downwash when landing a helicopter/tiltrotor immediately adjacent to a spot occupied by a shutdown helicopter, not folded and secured, may cause rotor system damage to the shutdown helicopter.
- Rotor blade tiedowns alone may not be sufficient to preclude rotor blade flapping and subsequent damage.
- In situations where a V-22 is landing in front of a spread helicopter, the risk for rotor blade damage increases with port winds over the flight deck.
- Extended hovering (e.g. fast roping) of V-22 or H-53 aircraft in proximity to any aircraft, even when rotor blades are folded and crutched and stabilator (if installed) folded, may result in damage to aircraft and equipment.

**Note**

In the event of a V-22 requiring respotting in the flight ready position, the aircraft can be towed and manually folded, if required. Other aircraft can launch and recover on spots forward and aft of a V-22 in all Blade Fold/Wing Stow (BFWS) configurations.

### 5.5.2 Ordnance Equipped Aircraft

When an aircraft carrying ordnance requires arming, the launch officer/LSE, after ensuring the aircraft is in the proper launch position and upon completion of the initial walkaround shall direct the pilot’s attention to the ordnance safety supervisor for arming. When the arming has been completed and the arming crew is clear, the ordnance safety supervisor shall signal the pilot with “thumbs up” and direct the pilot's attention back to the launch officer/LSE.

## 5.6 EMCON/ZIP-LIP LAUNCH PROCEDURES

### 5.6.1 General Procedures

When the use of radio is limited, operations may be conducted by use of other means of communication. Visual communications become extremely important, including the proper use of the ship’s flag command and display signals. Aircraft lighting, aldis lamp, blinker, and hand and arm signals become necessary to safely conduct flight operations. The above signals are explained in Figures 5-3, 5-4, and 7-1. Both aircraft and the controlling ship shall monitor the land/launch frequency. Radio transmission shall not be authorized unless required for safety of flight.

All flight operations conducted under EMCON conditions shall be thoroughly briefed and coordinated between the squadron and ship's controlling agencies. During EMCON conditions, increased emphasis shall be placed on conformance to safe operating procedures.

In addition to those command and display signals depicted in Figure 5-3 the following signal shall be utilized for tiedown removal prior to launch during EMCON: a momentary display of the green beacon (i.e., RED, GREEN, RED).

### 5.6.2 Day Launch Procedures

Day launch procedures during EMCON are conducted the same as normal operations except that visual signals are used to replace routine radio transmissions. Pilots shall ensure that all equipment that emits radio-electromagnetic energy is set in accordance with the EMCON conditions established by the ship's commanding officer. The crewchief may be positioned by the LSE and relay wind direction and velocity to the pilots for engine start and rotor engagement.

### 5.6.3 ZIP-LIP Procedures

During ZIP-LIP operations, launch procedures shall be the same as during EMCON, utilizing appropriate hand, flag, and light signals unless radio communications are required for safety of flight.

### 5.6.4 Electronic Emission Control Night Launch Procedures

Night launch procedures during EMCON are conducted the same as normal night operations except that light signals are used to replace routine radio transmissions. All communications/navigation/flight equipment that is not essential for safe night operations shall be secured.

**Note**

Weather minimums for helicopter night EMCON Operations shall be 500 feet above the normally prescribed delta pattern and a minimum of 3 nm visibility with a well defined horizon. Unaided Fixed Wing minimums shall be 3000 foot ceiling and 5 nm visibility. Aided Fixed Wing operations shall be in accordance with Case I and II procedures.

## 5.7 EMERGENCY AFTER LAUNCH

### 5.7.1 Visual Meteorological Conditions

If an emergency requires an immediate landing, the pilot shall prepare to jettison external stores/internal cargo and dump fuel as necessary to lower the aircraft gross weight below the maximum allowable landing weight. The pilot shall advise the tower of the nature of the emergency and desired course of action. The Air Officer shall inform the bridge of the situation, direct the preparation of the deck, and give the pilot an expected BRC and an estimated Charlie time. The expected Charlie time shall be based on the time required to clear the deck and get an acceptable Wind Over Deck (WOD) for the recovery. The pilot shall observe the progress of the turn into the wind and the preparation of the deck, and shall attempt to time the approach to avoid arriving at the deck too early.

**CAUTION**

H-53 AFCS failure or hydraulic failure requires winds on the bow with the deck spotted to allow a landing with the parking brake unlocked.

### 5.7.2 Night/Instrument Meteorological Conditions

Should an aircraft have an emergency during departure and require an immediate landing, the departure controller shall provide vectors until the aircraft is picked up by an approach or a final controller. Every effort shall be made to retain the aircraft on the departure frequency until safely aboard. PriFly shall be advised immediately of the emergency and the control frequency. Aircraft with emergencies that do not require immediate recovery shall continue normal departure procedures while the departure controller expeditiously acquires positive control. Once acquired, positive control and positive radar handoffs shall be employed until the emergency aircraft has been recovered or diverted.

### 5.7.3 Lost Communications During Departure

1. IFF/SIF squawk according to Figure 4-4.
2. If in VMC, remain visual and return to the ship for visual recovery.
3. If IMC or VMC on top, perform procedures in paragraphs 5.7.4, 5.7.5, and 5.7.6, as applicable.

### 5.7.4 Lost Communications Only During Departure (IMC)

In the event of lost communications with good TACAN or JPALS RELNAV, proceed as follows: continue climbout on assigned departure radial. Climb/descend to emergency marshal altitude, and proceed with emergency marshal instructions (Paragraph 6.5.10.1 or Paragraph 7.8.2.11).

### 5.7.5 Lost Communications and DME During Departure (IMC)

In event of lost communications and a loss of DME only, proceed as follows using a UHF-ADF or TACAN azimuth.

1. Continue briefed departure, utilizing DR to maintain appropriate arc until assigned departure radial is reached.
2. Continue outbound on departure radial climbing to emergency marshal altitude, reverse course, proceed inbound, and enter holding overhead in accordance with the TACAN/NDB overhead approach chart. Use prebriefed emergency BRC to determine relative radial.
3. Conserve fuel, monitor auxiliary receiver and guard, and be alert for joinup.
4. If joined by another aircraft, fly wing position to recovery.
5. If not joined, commence NDB approach at EEAT.

### 5.7.6 Lost Communications and NAVAIDS During Departure (IMC)

In event of complete loss of communications/navigation capability, proceed as follows:

1. Continue prebriefed departure, utilizing DR to arc and intercept departure radial.
2. Climb on departure to last assigned altitude.
3. At altitude, utilize DR and hold, conserving fuel, and fly appropriate triangles in accordance with Flight Information Handbook.
4. Attempt contact with ship utilizing survival radio on guard (243.0). Comply with AATCC instructions for radar approach. Once in the approach, no further communication from pilot to ship shall be required, except for further emergency or pertinent information.
5. If unable to contact ship, await joinup, and follow lead to recovery.
6. Upon reaching bingo fuel with no joinup, execute bingo procedures for divert field utilizing DR.
7. In absence of bingo/divert procedures, follow applicable ditching procedures for type aircraft.

## 5.8 CONTROL OF DEPARTING AIRCRAFT

Primary responsibility for adherence to assigned departure rests with the pilot; however, advisory control shall normally be exercised, with a shift to positive control as required by weather conditions, upon request, or when the assigned departure is not being adhered to.

### 5.8.1 AATCC Procedures After Launch

1. Ensure that communications and positive track are established with all aircraft to the extent possible under existing EMCON conditions.

2. Request NAVAID checks as necessary.

3. Maintain advisory control of departing point-to-point flights until pilots shift to en route frequencies, and of other aircraft until control is accepted by CIC, TACC, or another controlling agency.

4. Before releasing aircraft to another controlling agency, give each pilot (or flight leader) any pertinent information, such as changes in composition of flight, changes in PIM, or changes in mission.

5. When transferring control of aircraft, give the new controlling agency the distance and bearing of the aircraft being transferred, and obtain acknowledgment of assumption of control or in accordance with theater Special Instructions (SPINS).

### 5.8.2 TACRON Procedures After Launch

1. Monitor departing aircraft and expeditiously perform IFF checks in accordance with NTTP 3-02.1.3 Amphibious/Expeditionary Operations Air Control. IFF checks should normally be performed without pilot initiation and likely while departing aircraft are in contact with other agencies.

2. Upon switch to tactical control, Parrot/India status and mission tasking should be relayed without delay during initial contact.

### 5.8.3 Departing Aircraft Procedures After Launch

1. Report airborne.

2. Comply with departure procedures.

3. Report Popeye with altitude (if applicable).

4. Report canceling IFR.

## 5.9 SINGLE FREQUENCY DEPARTURE PROCEDURES

During Case II and Case III weather conditions a single frequency shall be used to issue launch clearance and departure control to single piloted aircraft in accordance with CNAF M-3710.7. Pilots shall switch to departure frequency on deck and communication checks shall be performed with all required agencies prior to issuing launch clearance. To reduce pilot workload during dynamic maneuvering (such as the Fixed Wing Visual Flight Join or when being launched for immediate Air Intercept Control) a single frequency departure may also be used in VMC. To enhance situational awareness, all aircraft involved may monitor the appropriate HD or AIC Net instead of Land Launch Frequency while on deck.

When a single frequency departure is used during a single piloted aircraft launch, the Air Officer or LSO will initiate the communication check-in sequence by directing the pilot to change to the departure frequency. Example: "51, push OLIVE" (side number, push departure frequency). The pilot will verify all required controlling agencies are on the departure frequency by initiating a communication check. Example: "Razor 51" (call sign, side number). The controlling agencies response is AATCC: "Center"; Air Officer: "Tower"; LSO: "Paddles".

## 5.10 PREPARING FOR RECOVERY

Aircraft operations shall not be conducted from surface ships that are not certified or waivered except in extreme situations such as emergency Medical Evacuation (MEDEVAC).

**WARNING**

Lack of aviation facilities certification indicates that deficiencies exist in the presence or operation of critical aviation systems or potentially unsafe deterioration of facilities, which may include flight deck non-skid or lighting, approach and landing, signalling systems or personnel qualifications.

### 5.10.1 Ship Preparations

The OOD shall ensure preparations for flight quarters are completed in accordance with Chapter 5. The OOD shall notify PriFly and AATCC of the expected BRC for recovery and of all impending course changes during aircraft operations. Safe aircraft recovery operations require strict adherence to NATOPS wind and deck limitations as depicted in Appendix A. Ship, embarked squadron commanding officers and detachment officers in charge may establish more restrictive limitations.

### 5.10.2 Bridge/PriFly Coordination

The Air Officer shall keep the bridge informed as to the readiness of the flight deck to land aircraft. When the deck is ready and the ship has steadied on the recovery course, the commanding officer or the OOD shall give PriFly clearance to recover aircraft. The Air Officer shall then announce on the 5 MC, “Standby to recover aircraft spots 1, 3, etc.”, and a green rotating beacon shall be displayed from PriFly, when appropriate. A sample recovery sequence with associated flight deck events and PriFly announcements is contained in Appendix C.

Aircraft should not be recovered while the ship is in a turn, except when authorized by the ship’s commanding officer or designated representative. Anticipated wind parameters and ship’s heel shall be communicated to the aircraft commander prior to execution of the turn.

**WARNING**

- Change of ship direction during recovery could result in a hazardous situation and place the helicopter outside recovery wind/roll parameters.
- When conducting operations behind a turning tail rotor aircraft, factors of proper deck spotting, aircraft types and distance between spots should be considered before permitting cross-cockpit takeoffs or landings to preclude potential injuries to flight deck personnel.

### 5.10.3 Night Operations

Night operations are among the most critical for both pilots and flight deck crews. The tempo of operations shall be reduced as compared to day operations. Slow and careful handling of aircraft by pilots and deck crew is required to enhance safety. All personnel concerned shall be indoctrinated in night operation procedures. All Fixed Wing night Case III/aided recovery procedures are outlined elsewhere in this manual.

Flight deck operations at night may cause some confusion between pilots/crews and directors. All signals must be clearly understood by everyone concerned. The following are required for flight operations:

1. The LSE shall be equipped with appropriate wands.
2. All flight deck personnel shall utilize clear lens goggles.
3. All optical landing aids and flight deck lighting shall be checked for proper operation prior to recovery operations.
4. During night/NVD operations proper light discipline shall be exercised.

**WARNING**

Maintenance on, or inspection of any portion of an aircraft that extends over the ship's deck edge is prohibited.

### 5.10.4 Night Wind Limitations

The wind limitations depicted in Appendix A or the shipboard operating bulletin shall be complied with for all night recoveries. The ship's embarked squadron commanding officers and detachment officers in charge may establish more restrictive limitations. The BRC shall be provided as early as possible to flight leaders/aircraft commanders to enable the flight to maneuver for proper entry into the designated pattern.

## 5.11 RECOVERING AIRCRAFT

### 5.11.1 Arrival Procedures

Aircraft entering the ship's control area, once released by mission controllers, shall switch to AATCC frequency for arrival instructions.

#### 5.11.1.1 Aircraft Initial Voice Check-In Procedures

Aircraft or flight leaders shall check in with AATCC with the following information:

1. Call sign.
2. Position (bearing and range relative to the ship).
3. Altitude.
4. Fuel state (in hours and minutes for helicopter or pounds remaining for fixed wing) of the lowest aircraft in flight.
5. Souls on board.
6. Ordnance remaining (see Paragraph 5.12.1, Recovering with Ordnance).
7. Other pertinent information.

#### 5.11.1.2 AATCC Arrival Information

The type and amount of information provided by AATCC will vary based upon Case recovery, environmental and operational conditions, EMCON condition, and other factors. AATCC will respond with the following:

1. Case recovery.
2. Expected Base Recovery Course or Expected Final Bearing.

**WARNING**

Passing any ship's heading information other than the Expected Base Recovery Course or Expected Final Bearing may affect safety of flight.

3. Weather information and altimeter setting.
4. Marshal instructions.
5. Expected approach time (EAT).
6. Estimated recovery time.

7. Other pertinent information.
8. Set state for fuel (fixed wing only).

**Note**

Time hack can be provided upon request.

### 5.11.1.3 Marshal Instructions

AATCC shall ensure that the following information has been provided to all aircraft prior to approach clearance:

1. Case Recovery.
2. Type approach.
3. Expected final bearing.
4. Weather and altimeter.
5. Marshal instructions.
6. Expected approach time.
7. Approach button.
8. Time check.

To reduce radio traffic, items of general or collective interest may be transmitted as a "99" broadcast by AATCC.

**Note**

Changes to BRC, altimeter setting, and other safety of flight information must be acknowledged.

### 5.11.1.4 Approach Instructions

AATCC shall issue the following information to each aircraft prior to approach clearance:

1. EAT.
2. Final control frequency.
3. Type approach.
4. Other pertinent information.

### 5.11.2 Smokelight Approach

This approach is used as a last resort when available equipment will not allow normal procedures to be utilized or when the ship cannot be visually acquired utilizing normal procedures and ditching is considered imminent. The ships and embarked squadron commanding officer, the detachment officer in charge and the pilot in command must have agreed to attempt the procedure. The aircraft is positioned 2 miles astern of the ship and proceeds inbound (180° relative bearing to the BRC). The aircraft descends at pilot's discretion to a safe altitude (100 feet) and airspeed (40). Ship's personnel drop smoke/matrix lights every 15 seconds (or other prearranged interval) and the pilot is kept informed of the number of smokelights in the water. The pilot at the controls follows the smokelights up the ship's wake, adjusting closure rate until visually acquiring the ship.

### 5.11.3 Diverting Aircraft

### 5.11.3.1 General

If weather conditions are below Case II or at night, a divert field or ship should be provided. The Air Officer and LSO shall be jointly responsible for ensuring that aircraft performance data pertinent to diversion is available and understood by ATC personnel.

1. The decision to divert aircraft shall be made by the ship's commanding officer.
2. The ship's Air Officer with input from the LSO or Squadron Representative shall make recommendations to the ship's commanding officer as to which aircraft should be or should not be diverted for flight safety. During IMC conditions, the Air Operations Officer shall make appropriate recommendations to the ship's Air Officer and LSO regarding the diversion of aircraft. In extremis, the LSO has authority to divert AV-8B/F-35B to prevent loss of life and/or aircraft.
3. The LSO shall make timely recommendations to the Air Officer regarding diversions based upon unsatisfactory pilot performance, landing conditions, or aircraft performance capability.
4. The pilot shall inform PriFly or AATCC when bingo state has been reached without diversion instructions.
5. The AATCC officer shall, if practicable, determine the condition of NAVAIDS, communications, and lighting at the divert field prior to first night or IMC recovery.

### 5.11.3.2 Divert Planning Considerations

1. Aircraft fuel state.
2. Range and bearing to divert field.
3. Weather at the divert field, both current and forecast.
4. Status and availability of the divert field for type aircraft.
5. Navigation assistance available.
6. Ordnance restrictions.
7. Aircraft mechanical condition.
8. Condition of flight deck.
9. Tanker availability.

### 5.11.3.3 AATCC Responsibilities

AATCC shall be alerted when aircraft is approaching diversion state and shall be prepared to take control of the aircraft when the divert order is issued. The following actions shall be completed:

1. Advise pilot of name of, magnetic heading to, and distance to the divert field. Obtain a read back of divert instructions.
2. Advise pilot to check gear up.
3. Instruct pilot to shift to control frequency en route.
4. Provide pilot with the latest available en route weather and altimeter setting at divert field and position from which divert was made.
5. If operating outside an ADIZ boundary, provide the pilot with necessary ADIZ information and advise the appropriate GCI site of the diverting aircraft's departure point, ADIZ penetration point, time of penetration, altitude, estimated time en route, destination, and any other pertinent information.
6. Maintain radar flight following and radio monitoring on the diverting aircraft for as long as possible and/or retain positive control responsibility for the aircraft until a positive transfer of control can be made to GCI, ARTCC, FACSFAC, or other agency ashore.
7. File a divert flight plan with the appropriate controlling agency and ensure similar information is provided to the appropriate air defense agency should an ADIZ penetration be necessary.
8. Receive an arrival report for diverting aircraft.

#### 5.11.3.4 Pilot Responsibility

Notify the ship by immediate precedence message upon landing.

## 5.12 SPECIAL SAFETY PRECAUTIONS

### 5.12.1 Recovering with Ordnance

**Note**

Appendix F is a list of weapons authorized for recovery.

#### 5.12.1.1 In-Flight Procedures

Pilots shall accomplish the following prior to entering the ship's control zone.

1. Determine if all ordnance has been expended upon completion of the firing mission. A visual check between aircraft shall be made of all rocket launchers.
2. In the event of hung ordnance, every effort shall be made to fire/jettison as appropriate. Consideration should be given to diverting to a land base.
3. The ship shall be notified as soon as it becomes apparent that ordnance must be brought back. In no case shall hung or unexpended ordnance be brought into the ship's control zone without clearance from AATCC or PriFly. Initial notification shall include the amount and type of hung/unexpended ordnance and, for hung ordnance, the time of last release attempt.
4. Properly safe all weapons systems.

#### 5.12.1.2 Shipboard Procedures

1. The bridge and other appropriate stations shall be notified.
2. Appropriate HERO condition shall be set.
3. Dearming crews shall standby on station.
4. Prior to jettisoning ordnance from the ship, approval must be granted by the ship's commanding officer.

#### 5.12.1.3 Air Officer Procedures

1. Clear landing spot for recovery.
2. Prior to recovery announce on the 5 MC: "Standby to recover (type aircraft) with hung ordnance on spot (spot number). Hung ordnance is (amount and type). All personnel remain well clear of the flight deck area."
3. Ensure that ordnance safety supervisor and the squadron dearming team are on station prior to recovery.
4. As required, ensure all aircraft on the flight deck and in the landing pattern have secured HF and/or FM transmitters, IFF, tacan, and radar altimeters.
5. The pilot shall not leave the cockpit until all ordnance and weapons systems have been properly safed.

**WARNING**

Failure to remain clear of the line of fire and/or danger area of an aircraft landing with hung ordnance may result in injury or death.

### 5.12.2 Helicopter/Tiltrotor Recovery Tiedown Procedures

Chocks and tiedowns shall be applied after landing upon signal from the LSE and with the concurrence of the aircraft commander, and shall remain attached until the aircraft is ready for launch. During short duration on-deck times, such as when rapidly loading troops or supplies, the aircraft may be chocked only. Tiedowns shall be installed in compliance with individual aircraft NATOPS flight manuals. Unless otherwise specified in aircraft NATOPS flight manuals, tiedowns shall be attached to mooring rings in the vicinity of the main landing gear first. H-53 drop tanks and landing gear shall be pinned prior to chock and chain personnel proceeding underneath the aircraft.

**WARNING**

Failure to pin H-53 drop tanks and landing gear prior to proceeding underneath the aircraft may result in injury or death.

### 5.12.3 Personnel Debarkation

Pilots of ramp equipped helicopters shall not lower their ramps to discharge passengers until signaled by the LSE.

For troop offload the LSE will not signal for the ramp until CCO troop handlers are present and recoveries/launches on adjacent spots are complete. Troops are escorted by the CCO handlers to the troop shelters from the flight deck as directed by the CCO. Passengers shall be escorted to safe area by flight deck, flightcrew, or CCO personnel.

### 5.12.4 Additional Safety Precautions

1. After calling the ball on final from CCA or TACAN, if no acknowledgement is received from the Air Officer (helicopters) or LSO (fixed wing), the pilot shall execute NORDO procedures.
2. While aircraft are being recovered, no personnel other than those required by this instruction shall be in the catwalks, on the flight deck, on the elevators, in gun tubs or on gun platforms, without the express permission of the Air Officer.
3. Personnel shall not stand in or otherwise block entrances to the island structure or exits off the catwalks.
4. Personnel shall remain clear of all cargo elevator hatches and weapons mounts outlined by danger lines.
5. Personnel shall not turn their backs to landing aircraft.
6. No director shall give signals to a pilot who is being controlled by another director except in an attempt to avert an accident.
7. To minimize the possibility of an aircraft landing on a foul deck, landing spot/deck edge lights shall never be turned on without the express permission of the Air Officer.
8. During instrument recoveries, PriFly shall keep AATCC informed as to the status of the deck and provide estimated time the deck will be clear. AATCC shall keep PriFly advised of the landing sequence on final and what single frequency approach frequency the aircraft is operating on, e.g.,: “Primary, Center, Scotch 41, 5 miles final button Purple.”
9. Ship’s maneuvering with helicopters on deck and rotors turning shall be conducted in a manner so as to keep winds and deck motion within the operating envelopes of the aircraft. Prifly shall notify all aircraft on deck of impending ship’s turns.

**WARNING**

Maneuvering that places winds and deck motion out of limits may result in loss of aircraft and crew.

10. CIC and AATCC shall keep PriFly informed of any aircraft known or suspected of having radio failure.

11. During night operations, green and red wands shall be used only by the flight deck supervisor or launch officer.
12. The taking of flash pictures during flight operations is prohibited.
13. Night approaches to spot 1 are not authorized.
14. Right seat landings on spot 1 are not recommended.
15. LHA 6 Type is equipped with the MK-53 Decoy Launching System, comprised of Nulka and Super Rapid Blooming Offboard Chaff (SRBOC). Should a missile threat be encountered while in a hostile environment, Nulka could dispense into airborne aircraft in proximity (within 3.5 NM and at or below 3,500 feet) to the ship with little or no warning. Aviation units shall consult local SOP for further guidance.

**WARNING**

- The AV-8B/F-35B safe parking line does not provide adequate rotor clearance for V-22/H-53 aircraft.
- Should a missile threat be encountered in a hostile environment, Nulka can dispense into airborne aircraft in proximity to the ship with little or no warning, resulting in aircraft damage or injury to aircrew.

## 5.13 EMCON/ZIP−LIP PROCEDURES

### 5.13.1 EMCON Procedures

When the use of radio communications is limited, operations may be conducted by use of other means of communication. Visual communications become extremely important, including the proper use of ship's aircraft lighting, flag command, and display signals. Aldis lamp, blinker, and hand and arm signals become necessary to safely conduct flight operations. These signals are explained in Figures 5-3, 5-4, 7-1, and in NAVAIR 00-80T-113. Both aircraft and controlling ship shall monitor the land/launch frequency. Radio transmissions shall not be made unless required for safety of flight.

All flight operations conducted under EMCON conditions shall be thoroughly briefed and coordinated between the squadron and the ship's controlling agencies. During EMCON conditions, all concerned have increased responsibility to conform to safe operating procedures.

### 5.13.2 EMCON Recovery Procedures

#### 5.13.2.1 Helicopter EMCON Recovery Procedures

The ceiling shall be 500 feet above the highest normally prescribed Delta pattern, with a minimum of 3 nm visibility and a well defined horizon. Returning pilots shall plan to be in the Delta pattern prior to the scheduled recovery time. They shall shift to and monitor PriFly frequency when the ship is in sight. Each aircraft shall have anticollision lights on, and position lights on bright when within 10 nm of the ship.

Once established in the Delta pattern, the position lights shall be set to flashing. The pilot shall receive a flashing green Aldis lamp signal at the abeam position in the Delta pattern. The pilot shall acknowledge by turning navigation lights to steady-bright leaving the anticollision lights on and descending to the Charlie pattern. At the abeam position, the aircraft shall receive a steady green Aldis lamp signal, conform to normal lighting procedures, and continue with the approach.

### 5.13.3 ZIP-LIP Procedures

During ZIP-LIP operations, recovery procedures shall be the same as during EMCON, utilizing appropriate hand, flag, and light signals unless radio communications are required for safety of flight.

CHAPTER 6

# Fixed-Wing Procedures

## 6.1 GENERAL FIXED-WING

### 6.1.1 Fixed-Wing Aircraft Safety Precautions

Fixed-wing aircraft engines are extremely susceptible to FOD. Any debris in the vicinity of the aircraft, including flight deck and nonskid debris, can be ingested by the engine. Ingestion may cause the loss of an engine and possibly result in loss of the aircraft.

**WARNING**

Personnel can be injured and equipment damaged by FOD propelled by aircraft jet blast.

Exhaust gases from fixed-wing aircraft have tremendous speed and impact force. Special precautions shall be taken to remove or thoroughly secure all loose items, such as missile/gun director covers, deck drain covers, life raft covers, or padeye covers, that are near the landing area or the approach path. All personnel shall remain clear of a landing aircraft. For aircraft near a landing aircraft, all attached panels and canopies shall be closed, and all equipment shall be secured.

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### 6.5.8 Missed Approach Procedures

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# CHAPTER 7

# Helicopter Procedures

## 7.1 HELICOPTER SAFETY PRECAUTIONS

1. Personnel shall not approach or depart a helicopter while rotors are being engaged or disengaged.
2. Helicopters should not routinely be deck taxied on the flight deck.
3. Helicopters shall not be towed or pushed while rotors are engaged.
4. A helicopter shall not be flown over another aircraft on launch or recovery.
5. Only spots that afford visual reference to the deck shall be used for night helicopter launches.
6. Ensure adherence to launch and recovery spot limitations as defined in Appendix E.
7. Personnel required to be in the area of operating helicopters shall exercise extreme caution and observe the signals/directions of the LSE or combat cargo representative as appropriate.
8. Dual-engine helicopters shall not be intentionally hovered single engine over a deck spot. If topping checks cannot be performed in contact with the deck, they must be performed in flight at an appropriate altitude.
9. Any helicopter parked Tail-Over-Water (TOW) should have cargo ramp (if so equipped) in full-up position.
10. The APU shall be continuously monitored by a qualified person whenever it is in operation.
11. V-22 and H-53 launch and recovery operations should not be conducted from spots immediately behind unsecured tail rotor aircraft. If V-22 or H-53 launch and recovery operations are required from spots immediately behind unsecured tail rotor aircraft, consideration should be given to securing the aircraft and blades with initial (four-point) tie downs and increasing the wind over the deck.
12. Rotors of all helicopters shall be spinning at or above 100% $N_r$ or folded and secured (crutched if capable) if H-53 or V-22 flight operations are being conducted on an adjacent spot. All H-53 helicopters should be spinning at 100% $N_r$, folded, or tied down if V-22 or H-53 flight operations are being conducted to the spot forward of its position.
13. Helicopters landing behind engaged tail rotor aircraft shall not conduct cross-cockpit takeoffs or landings for LSE safety.
14. Ensure that all aircraft and equipment are parked starboard of the solid yellow V-22/H-53 Safe Parking Lines for V-22 and H-53 vertical operations.
15. Ensure that all aircraft and equipment are parked starboard of the alternating red and white Fixed Wing Safe Parking Line for EC-225, H-60, H-47, H-58, H-64, H-6, H-3, and H-1 operations.

## 7.2 APU START

When aircraft are spotted on the flight deck, pilots shall proceed with the prestart procedures and signal the LSE/director when ready to start the APU.

The LSE/director shall request clearance for APU start from the Air Officer in PriFly via the flight deck supervisor. PriFly shall display a red rotating beacon and announce the following over the 5 MC: “Check chocks, tiedowns, fire bottles, and all loose gear about the flight deck, helmets buckled, goggles down, start APU on LSE/director signal.”

The LSE/director shall relay the clearance to the pilot before APU start can be initiated. APU starts may be requested while aircraft are in the parking area (slash). Radios shall be turned on and set to land/launch frequency as soon as practicable after APU is started. The MFFV shall be manned for all APU or main engine starts to include maintenance turns and engine wash/rinse procedures.

### 7.3 ROTOR BLADE SPREADING

All blade spreads shall be done under the supervision of a LSE director. The pilot shall request and must be granted clearance before blade spread can be attempted. Blades shall not be spread while the aircraft is under tow or being pushed. PriFly shall ensure relative winds are within aircraft limitations prior to blade spread. The maximum non-turbulent winds relative to the helicopter shall be less than 45 knots from any quadrant.

### 7.4 ENGINE START

When ready to start engines, the pilot shall request clearance from the LSE/director by a raised hand displaying one, two, or three fingers to indicate which engine is desired to start. The LSE/director shall request clearance from PriFly via the flight deck supervisor. PriFly shall ensure that winds are within limits for start/engagements, display a red rotating beacon (amber for skid-configured helicopters and V-22), and then announce clearance for engine start over the 5 MC circuit. Upon signal from the LSE/director the pilot shall start engines.

A rotor brake failure shall be recognized as an emergency. Prior to disengagement with a known or suspected rotor brake failure, the ship shall provide optimum winds for shutdown and resulting windmilling stop of the rotor system.

The mechanical latching of weapons on aircraft racks/launcher shall be completed before the engine(s) on that aircraft is/are started for launch.

**Note**

Certain Army and Air Force helicopters are not equipped with rotor brakes; rotor blades begin turning upon engine startup.

### 7.5 ROTOR ENGAGEMENT

When ready to engage rotors, the pilots shall give the LSE the ready-to-engage signal. The LSE shall relay this request to the flight deck supervisor, who in turn shall signal PriFly when spotted aircraft have indicated their readiness to engage.

Except as indicated below, helicopters should not engage rotors while the ship is in a turn, unless approved by the ship's commanding officer or designated representative. Anticipated wind parameters and ship's heel shall be communicated to the helicopter aircraft commander prior to execution of the turn.

**WARNING**

Rotor engagement shall not be attempted unless the tiedown configuration is as stated in the aircraft NATOPS flight manual. Failure to comply with this requirement may induce ground resonance.

Approval of engaging/disengaging AH-1Z and UH-1Y rotors during a turn is dependent the following limitations being enforced:

1. Engagement/disengagement is allowed during turns, but prohibited during zig-zag maneuvers.
2. The resultant angle of the ship deck pitch and roll angles, at the location of the air vehicle, shall be less than 6 degrees.
3. Engagement/disengagement of rotors is prohibited during turns when the wind over deck is greater than 40 knots, from any heading.
4. Engagement/disengagement is prohibited in sea states greater than SS 5.

**CAUTION**

Inadvertent control system inputs and out–of–balance conditions may cause a condition where rotor system structural damage can occur as the rotor transitions through 65 percent rotor speed.

The Air Officer shall ensure that proper wind conditions exist for engagement. If high winds exist, rotor engagements should commence with the downwind aircraft and work upwind.

**WARNING**

- Reported winds as displayed in PriFly may vary greatly with existing winds over the deck.
- Extreme care shall be exercised when engaging/disengaging rotors if other aircraft are launching or recovering.

When ready for engagement, an amber light shall be displayed to direct the flight deck supervisor and LSEs to give the engage signal to the pilots.

Relative winds shall be provided to the pilots of all aircraft either by radio, 5 MC, or hand and arm signal indicating both direction and velocity of wind. The pilot of each aircraft shall acknowledge clearance prior to attempting engagement.

**WARNING**

- Personnel shall not walk under rotor blades until the blades have stopped or come up to full speed. Clearance shall be received from the LSE prior to passing under rotor blades.
- Personnel shall not pass under tail booms or tail rotors of turning aircraft with the exception of loading/unloading evolutions on H-53s.

## 7.6 HELICOPTER LAUNCH PROCEDURES

When green deck signal is given, the LSE shall recheck that the aircraft is clear of all tiedowns and the area surrounding the aircraft is clear of equipment and personnel. The LSE shall also check that all airborne aircraft are clear of the launch area, and only then shall give the takeoff signal to the helicopter. The pilot shall not commence takeoff until this signal is received from the LSE and the winds for launch are received from PriFly.

### 7.6.1 Night Helicopter Launches

Night launching procedures for helicopters are the same as for day with the following exceptions:

1. LSE shall use amber wands.
2. Flight deck personnel shall utilize goggles with clear lenses.
3. During prelaunch sequence, flight deck personnel, LSEs, and control tower personnel shall cycle all control knobs and switches on the Visual Landing Aid (VLA) control panels to ensure each element is functioning properly. For those lights that may be obscured from the control panel operator's vision, assistance shall be provided by an LSE to confirm that the switch and knob settings produce the appropriate indications.
4. SAR helicopter(s) and rescue boat(s) shall be equipped with night signaling devices during all night operations.

5. Pilots shall ensure that all aircraft light switches are positioned OFF prior to electrical system activation.
6. External aircraft light signals shall be utilized as outlined in night lighting procedures (Figure 7-1).
7. PriFly/OOD shall adhere to maximum relative wind velocity charts contained in Appendix A for night helicopter launches and recoveries.
8. Pilots should not initiate any radio frequency changes or heading changes prior to reaching 200 feet.
9. PriFly/AATCC shall not require a frequency change or heading change prior to reaching 200 feet unless required for safety reasons.

**Note**

Night launches from forward Starboard spots afford limited tower visibility. PriFly will be unable to provide assistance normally afforded to aircraft operating from other spots.

Figure 7-1. Night Lighting Procedures

| HELICOPTER SIGNAL | HELICOPTER LIGHTS |
|---|---|
| Ready to start APU | Red cockpit dome light on or red lens flashlight. |
| Ready to start engines | External navigation lights on STEADY DIM. |
| Ready to engage rotors | External navigation lights on FLASHING DIM. |
| Ready for takeoff | Anticollision lights on, navigation lights on STEADY BRIGHT. |
| After takeoff | Anticollision lights on, navigation lights on STEADY BRIGHT. |
| 180° abeam position/right seat landing | Navigation lights on STEADY BRIGHT. Anticollision lights on. |
| 180° abeam position/left seat landing | Navigation lights on FLASHING BRIGHT. Anticollision lights on. |
| After final landing, or when on deck for extended period | Anticollision lights off. Navigation lights on FLASHING DIM. |
| Ready for disengage rotor | Red dome light on or red flashlight. Navigation lights on FLASHING DIM. |
| **Note** May be modified by PriFly to accommodate weather conditions and aircraft characteristics. Use day hand signals during NVD operations. | |

## 7.7 HELICOPTER DEPARTURE PROCEDURES

### 7.7.1 Case I, Visual Meteorological Conditions Departure to Rendezvous

This departure may be used when IMC is not anticipated during departure and subsequent rendezvous. Helicopters shall clear the control zone at or below 300 feet or as directed by PriFly. Rendezvous shall be accomplished in accordance with the flight brief.

### 7.7.2 Case II, Visual Meteorological Conditions to Visual Meteorological Conditions On Top

Weather at the ship not less than 500 foot ceiling and 1 mile visibility. Helicopters shall depart via Case I departure and maintain flight integrity below the clouds. Weather conditions permitting, departure on assigned missions shall also comply with Case I procedure. If unable to maintain VMC, helicopters shall proceed in accordance with Case III departures.

### 7.7.3 Case III, Instrument Meteorological Conditions

Whenever weather conditions at the ship are below Case II minimums, or there is no visible horizon, or when directed by the commanding officer or OTC, helicopters shall launch at not less than 1 minute intervals, climb straight ahead to 500 feet, and intercept the 3 mile arc. They shall arc at 3 miles to intercept assigned departure radials. Upon reaching the assigned departure radial, turn outbound and commence climb to assigned altitude. Figure 7-2 illustrates Case III departures. Departure radials shall be separated by a minimum of 20°.

**Note**

Modifications to Case III procedures are not authorized.

1. Helicopters shall launch on the assigned departure frequency, vice land/launch, and monitor guard. PriFly shall monitor departure frequency once airborne.

2. Helicopters launching on tactical missions shall rendezvous as briefed, report KILO (aircraft mission readiness), and be switched to assigned tactical control agency.

3. Departing aircraft shall report the following:

   a. Airborne.

   b. Arcing.

   c. Established on departure radial.

   d. POPEYE with altitude.

   **Note**

   When in IMC, POPEYE is a mandatory report for single aircraft upon reaching assigned departure altitude or FL 180 for fixed wing. This report alerts the departure controller that further instructions are required.

   e. On top with altitude.

   f. KILO (mandatory).

4. Minimum separation for departure radials is 20°. Assignment depends upon:

   a. Aircraft mission.

   b. Topographical features.

   c. Reserved radials for emergency use.

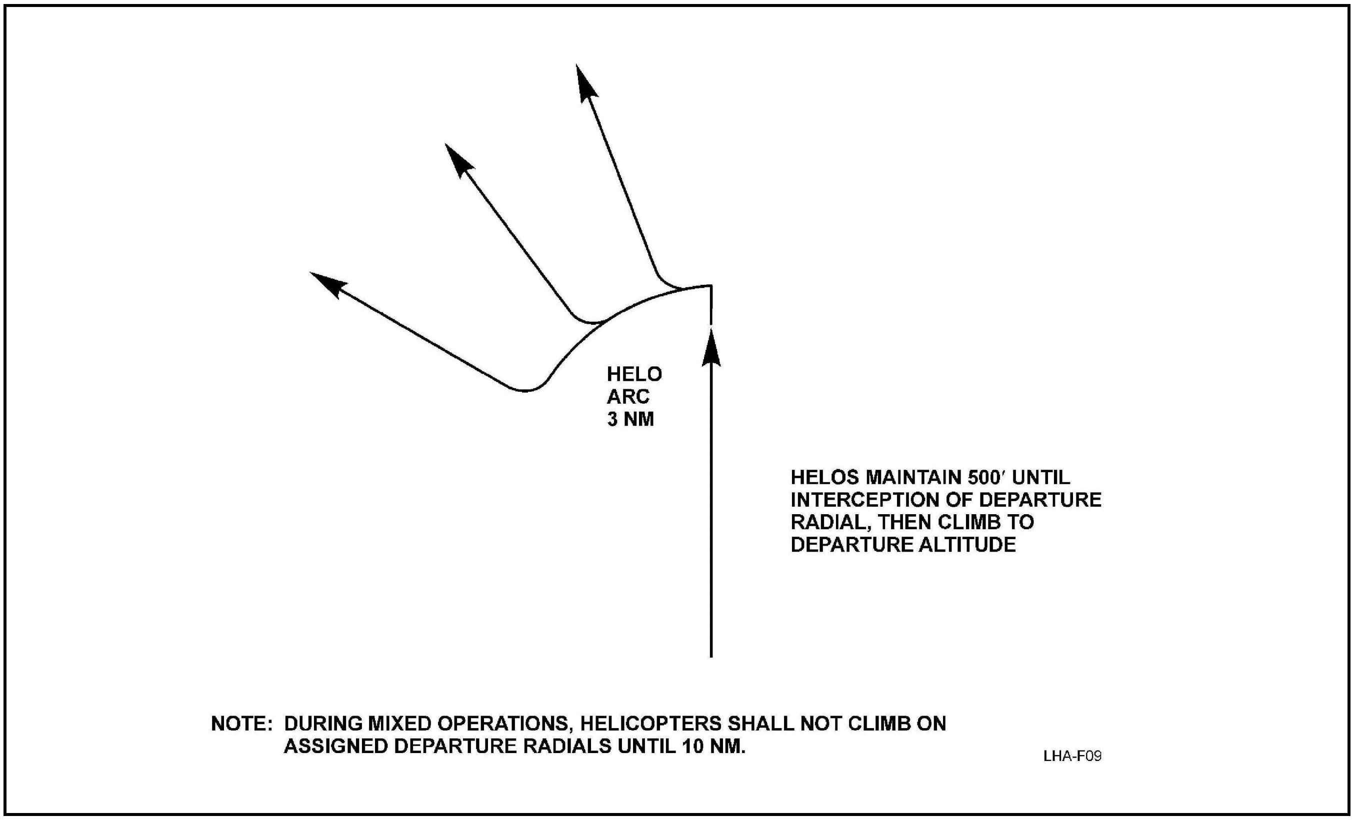
   d. Ships in formation.

   e. Airspace restrictions (ADIZ, hot, warning, restricted, prohibited areas, etc.).

   **Note**

   Similar type aircraft may launch at 1-minute intervals. If radar contact can be established within 1 mile after takeoff, AATCC may clear the next aircraft to depart. During mixed operations, there shall be a 2-minute launch interval between the last helicopter and first fixed wing.

Figure 7-2. Case III Helicopter Departure Patterns




## 7.8 HELICOPTER APPROACH AND RECOVERY

### 7.8.1 Helicopter Case I Approach Procedures

Case I may be used when it is anticipated that aircraft will not encounter IMC at any time during descent, break, and pattern established on the port side of final approach. Weather minimums of 1,000 foot ceiling and 3 miles visibility are required in the control zone.

**Note**

During mixed aircraft operations, helicopter break altitude shall not exceed 300 feet.

Flights shall check in with AATCC as in Paragraph 5.11.1. Pilots shall report ship in sight when visual contact with the ship is gained VMC; AATCC shall switch aircraft to PriFly frequency by 5 nm (VMC). Unless otherwise directed by PriFly, flights shall proceed to and hold in the overhead Delta pattern and plan their descent and break to meet the designated recovery time and maintain an orderly flow of traffic into the Charlie pattern.

#### 7.8.1.1 Helicopter Case I Holding

Case I holding for helicopters is performed in the overhead, port, or starboard Delta patterns as depicted in Figure 7-3.

1. The overhead Delta pattern is a VFR left-hand racetrack pattern established in the vicinity of the ship. It is oriented on the BRC and close aboard the starboard side at an optimum airspeed. During heavy traffic periods additional Delta patterns may be utilized as assigned by PriFly.
2. The starboard Delta pattern is a holding pattern established on the starboard side of the ship's 045-110 relative bearing between 1 and 3 miles. It is a right-hand racetrack flown at 300 feet and 80 knots.

3. The port Delta pattern is a holding pattern established between the ship's 225-315 relative bearing between 3 and 5 miles. It is a left-handed racetrack flown at 300 feet and 80 knots.

#### 7.8.1.2 Helicopter Charlie Pattern

The Charlie pattern is a left-hand racetrack pattern on the port side of the ship. The upwind leg parallels the BRC. All aircraft shall enter the Charlie pattern as depicted in Figures 7-3, 7-4, and 7-5 unless otherwise directed by PriFly or AATCC. Landing interval shall be established or adjusted upwind so as not to extend the downwind leg.

#### 7.8.1.3 Prep Charlie

Aircraft cleared to prep Charlie shall conform to normal Charlie pattern entry procedures and once established in the pattern, conform to the racetrack pattern depicted in Figures 7-3 through 7-5 until cleared by PriFly.

#### 7.8.1.4 Helicopter Night Case I Recovery Pattern

The helicopter night Case I recovery pattern is a left-hand pattern on the port side of the ship. The pattern is extended downwind allowing for a complete turn to final prior to beginning descent. The straight-in final approach is flown using available visual landing aids such as V/STOL OLS.

**Note**

The Stabilized Glideslope Indicator (SGSI) has been removed from all LHD and LHA type ships.

#### 7.8.1.5 Standard Helicopter Landing Patterns

The Charlie Pattern is the standard Case I helicopter landing pattern. Landing pattern for port spots is an approach starting not later than abeam the intended point of landing with a turn to intercept the 45° line at the 90° position. Landing a helicopter on a spot immediately in front of another helicopter should be avoided whenever possible.

Helicopters landing behind engaged tail rotor aircraft shall not conduct cross-cockpit landings for LSE safety.

**CAUTION**

- Combination of relative winds and rotor downwash when landing a helicopter/tiltrotor immediately adjacent to a spot occupied by a shutdown helicopter, not folded and secured, may cause rotor system damage to the shutdown helicopter.
- Rotor blade tiedowns alone may not be sufficient to preclude rotor blade flapping and subsequent damage.
- In situations where a V-22 is landing in front of a spread helicopter, the risk for rotor blade damage increases with port winds over the flight deck.

**Note**

- When helicopters approach on the 45° bearing to land immediately in front of a spot occupied by another helicopter, rotor clearances (main and tail) between the two aircraft during the final portion of a 45° approach are significantly reduced.
- When approaching a spot immediately in front of a spot occupied by another helicopter, the final portion of the approach on the 45° bearing should terminate at a point directly abeam the intended landing spot. From this point the final transition is flown by sliding sideways to a hover over the landing spot. Cross-cockpit landings should be avoided.

The Charlie pattern and the night Case I helicopter recovery pattern are both acceptable night Case I recoveries. The Air Officer shall ensure that all airborne aircraft and the squadron duty officer are informed when changing from one night landing pattern to another. Simultaneous use of the Charlie and night Case I helicopter recovery patterns is prohibited.

The completion of the night Case I recovery pattern depends on the location of aircraft on the landing spots. If the landing spots aft of the assigned landing spot are clear, the helicopter may complete a straight-in approach over the stern and air taxi to the landing spot. When there are obstructions between the stern and the landing spot, the Air Officer shall direct the pilot to adjust the pattern to fly close aboard the port side and intercept the 45° lineup of the assigned landing spot.

#### 7.8.1.6 Nonstandard Helicopter Landing Patterns

Nonstandard patterns are as follows:

**Note**

Landing patterns for starboard spots will vary depending on the position of aircraft spotted on the flight deck (Figure 7-5).

1. Cross-Deck — A cross-deck approach shall be flown the same as a standard landing pattern except the approach shall continue across the flight deck to assigned landing spot (Figure 7-5).
2. Helicopter Around Stern — Starboard spots may be utilized by entering the normal Charlie pattern, calling abeam port quarters, descending to 200 feet by the astern position, continuing up the starboard side to intercept an approximate 45° angle to the spot and then straight in (Figure 7-5).
3. Helicopter Modified Straight-In — PriFly may approve a straight-in approach to the spot depending on traffic in the pattern.

### 7.8.2 Helicopter Recovery Procedures

Upon ready deck, PriFly will normally give a “Charlie” to the number of aircraft that there are spots available, giving consideration to low fuel state aircraft. In conjunction with “Charlie”, PriFly shall also broadcast the BRC, altimeter, and wind condition across the deck. Aircraft should plan the descent and flight break to the landing pattern as depicted in Figures 7-3 through 7-5. Care should be taken to orient the landing pattern on the recovery course specified when it differs from the ship’s heading. All pilots should take proper interval at the upwind break.

When “Charlie (number )” (i.e., “Charlie 5”) is given, aircraft shall enter the landing pattern with the lead aircraft planning to be over the deck at the expiration of the number of minutes specified. Expect Charlie spot (number) will be given with the anticipation that the first aircraft will be cleared to land upon arrival. When “Charlie spot (number)” is given, the aircraft is cleared to land. The pilot shall indicate gear down (if applicable) and seat position as appropriate. LSEs shall pick up landing helicopters at the 45° position in the approach turn of the Charlie pattern or at 100 yards astern in the helicopter night Case I recovery pattern.

Launch and recovery of other aircraft when a V-22 has rotors turning on deck is authorized as shown in Appendix E, Figure E-2.

Figure 7-3. Delta and Charlie Patterns for Helicopters

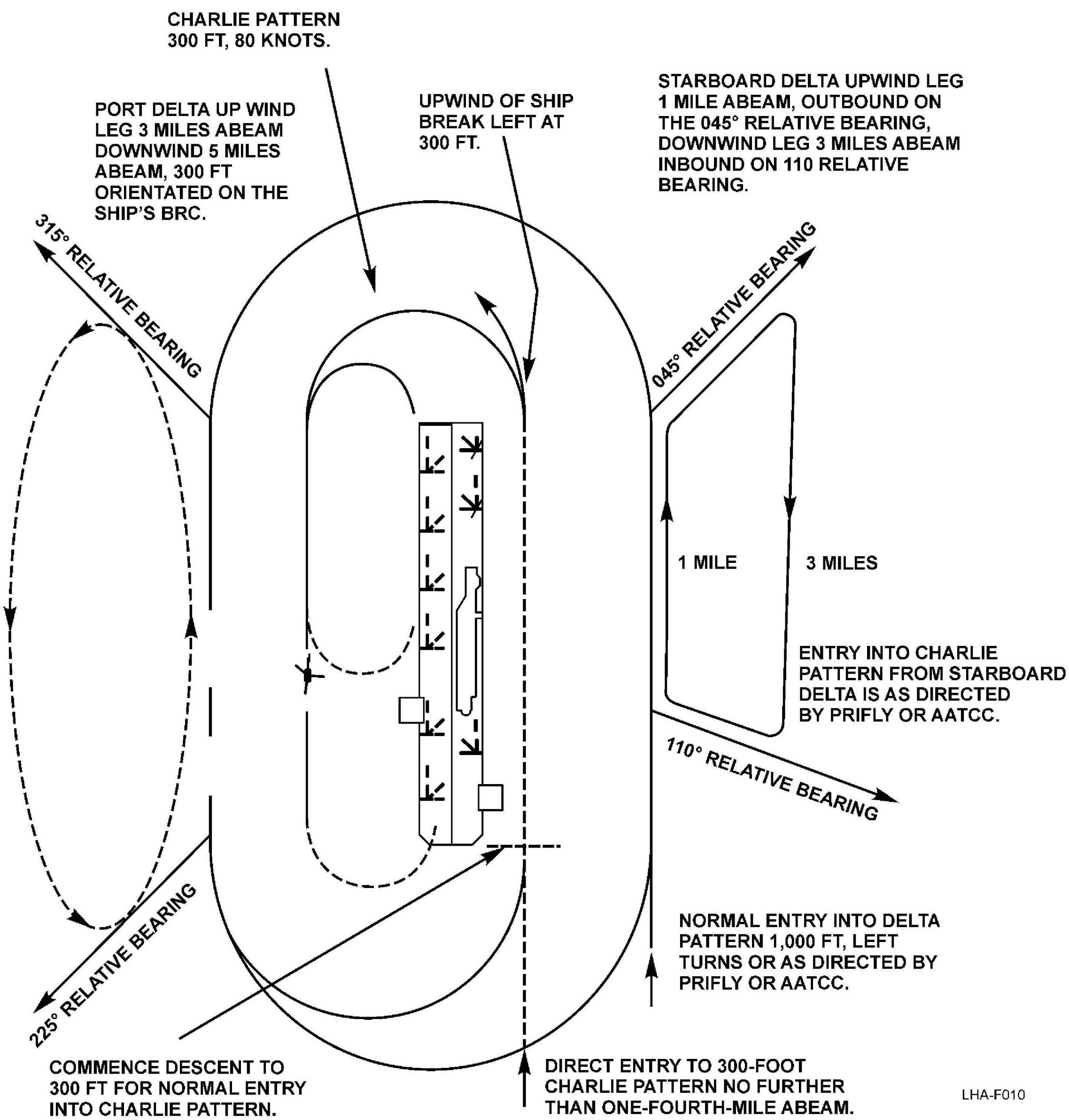


Figure 7-4. Helicopter Night Case I Recovery Pattern

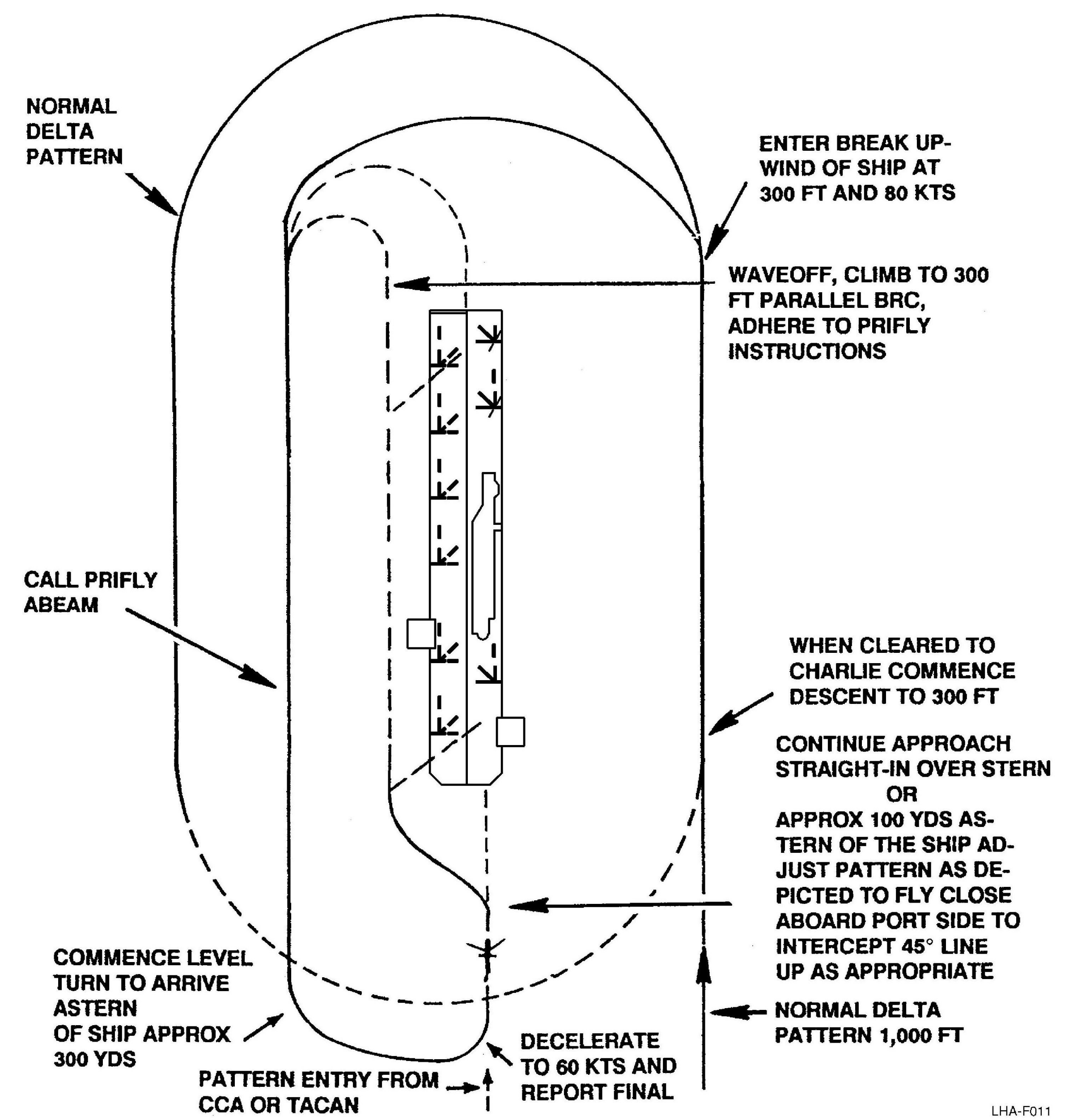
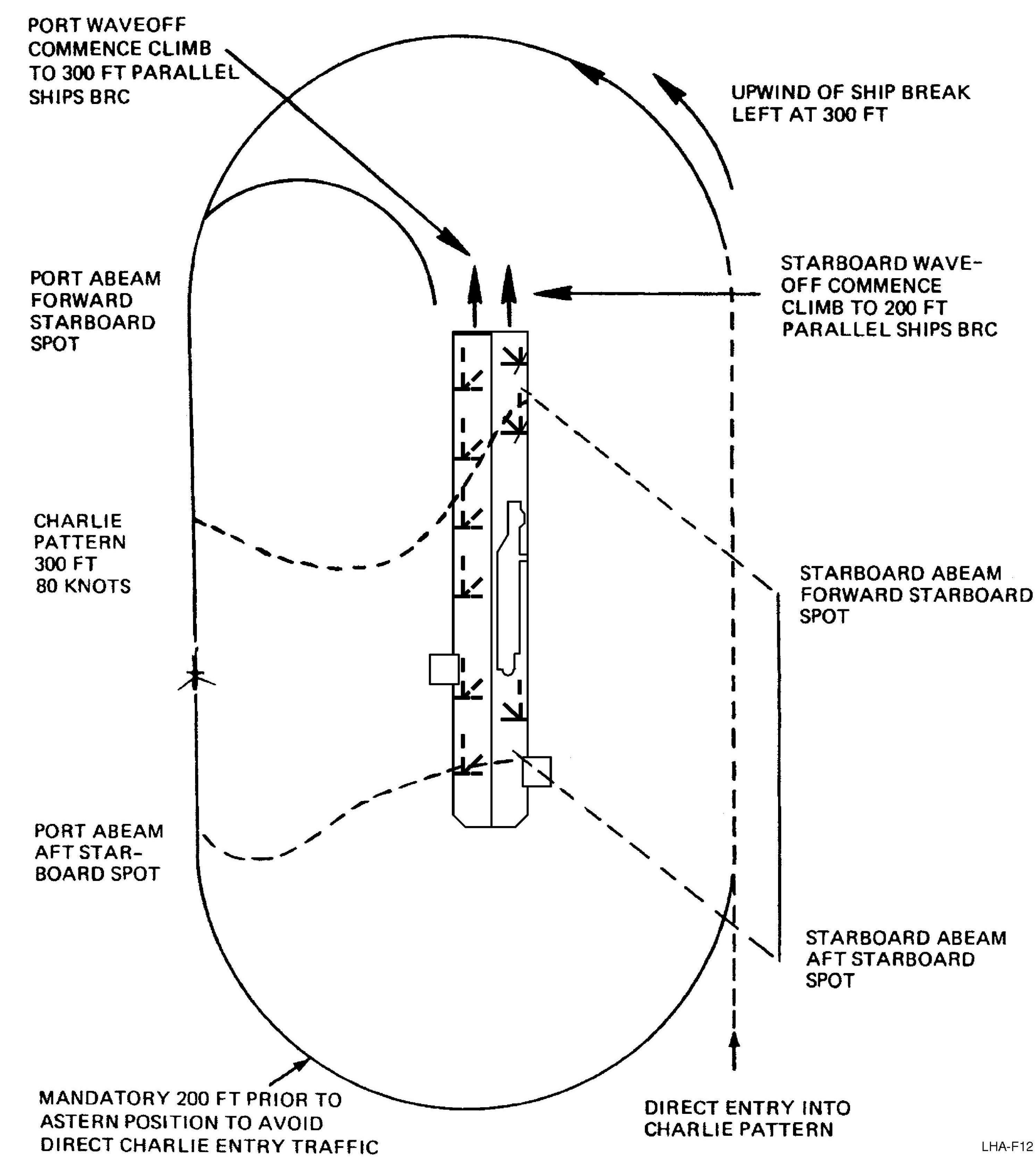


Figure 7-5. Helicopter Recovery Patterns for Starboard Side Spots



#### 7.8.2.1 Waveoff

A waveoff shall be executed in the following situations:

1. Upon voice command from PriFly or loss of communication with PriFly.
2. Upon command from the LSE.

**Note**

LSE signals are advisory in nature except for "Waveoff" and "Hold", which are mandatory.

3. Upon loss of visual contact with LSE during final approach.
4. Any time the aircrew feels the approach cannot be safely completed.

Pilots shall report "(aircraft identification), waving off" and parallel the BRC on the appropriate side of the ship and reenter the appropriate Case I pattern. Should reentry into the Case I pattern not be possible, the aircraft shall climb straight ahead and request instructions from PriFly.

#### 7.8.2.2 Helicopter Case II Approach Procedures

Case II procedures shall be used whenever weather or meteorological conditions at the ship are below Case I minima, but greater than a 500 foot ceiling and 1 mile visibility. During Case II, positive control shall be utilized until the flight leader/pilot reports the ship in sight. AATCC shall be fully manned and ready to assume control of Case III in the event weather deteriorates to below Case II minimums.

**Note**

Case II recoveries shall not be conducted concurrently with Case III departures.

#### 7.8.2.3 Helicopter Case III Approach Procedures

Case III procedures shall be used whenever weather conditions at the ship are below Case II minima, or when no visible horizon exists, or when directed by the commanding officer or OTC. Positive control shall be provided by AATCC from letdown through final approach until the flight leader/pilot reports ship in sight and requests to proceed visually. Case III formation recoveries are not authorized except when an aircraft experiencing difficulties is recovered on the wing of another aircraft. Formation flights by dissimilar aircraft shall not be attempted except in extreme circumstances when no safer recovery method is available. All Case III approaches shall terminate in a straight-in, single-frequency approach. Precision radar shall be used whenever available. The procedures below are mandatory for all Case III helicopter recoveries.

#### 7.8.2.4 Helicopter Marshal Patterns

Assignment of marshal is predicated on topographical features, ships in formation, operational restrictions, and aircraft capabilities. Marshal patterns shall be established clear of clouds if possible. A formation of two aircraft may be assigned the same altitude for purpose of section approach if one is experiencing communication or navigational equipment difficulties. Otherwise aircraft shall be separated by 500 feet. Expected approach times shall be issued in 2 minute intervals. All radials are relative to the BRC. All patterns are standard rate turns with 2 mile legs. Marshal airspeed shall be based on holding airspeeds in applicable aircraft NATOPS manuals.

1. LH-4 — 090° radial at 7 miles, altitude as assigned. Base altitude no lower than 1,000 feet, right-hand turns.
2. LH-5 — Non-directional beacon/TACAN overhead marshal. An overhead holding pattern on the 030° relative bearing, altitude as assigned (not less than 1,500 feet), 1 minute/2 nm racetrack pattern, left-hand turns.

NDB/TACAN overhead marshal base altitude is 2,500 feet during mixed aircraft operations.

### 7.8.2.5 Approach Instructions

See Figures 7-6 to 7-8.

AATCC shall issue the following information to each aircraft prior to approach clearance:

1. EAT.
2. Final control frequency.
3. Type approach and outbound bearing (LH-5 only).

**Note**

Assigned outbound bearing shall be continuously updated during overhead marshal recoveries to maintain a minimum 20° clockwise from the reciprocal of the final bearing.

4. Other pertinent information.

### 7.8.2.6 Departing Marshal

Pilots shall adjust patterns to depart marshal at assigned EAT. Deviations from EAT shall be reported immediately so that steps may be taken to alleviate conflicts. Descent from marshal shall be at 90 knots and no greater than 500 feet per minute to the final approach fix. Helicopters shall assume landing configuration prior to the Final Approach Fix (FAF).

### 7.8.2.7 Helicopter Radar Approaches

**Note**

AATCC shall handle tiltrotor aircraft using fixed-wing procedures when in airplane mode and helicopter procedures when in conversion mode.

1. Standard approach pattern altitude is 1,000 feet.
2. Helicopters shall commence transition to landing configuration prior to the 3 nm Final Approach Fix.
3. If conducting an en-route radar approach or when in the CCA pattern, aircraft shall be vectored to intercept the BRC at a point no closer than the Final Approach Fix (FAF). Intercept angle should not exceed 20 degrees if aircraft intercepts the BRC at the FAF or within 2 miles outside of the FAF. Intercept angle should not exceed 45 degrees when intercept occurs more than 2 miles outside of the FAF. Aircraft should not intercept BRC from a position above the assigned glideslope or descent gradient for type radar approach being flown.
4. When directing deviations from a published instrument approach, AATCC shall advise the pilot of the reason.
5. AATCC shall coordinate practice approaches and plan aircraft de-confliction with Tower prior to aircraft entering the Control Zone during Case I and II operations.
6. AATCC shall issue climbout procedures for all practice approaches. Missed approach procedures contained in Paragraph 7.8.2.8 shall be used in all other cases.
7. The final controller is required to advise pilot of the following information during approach after establishing positive communications control:
   a. Type of approach on initial contact if not conducting a PAR (e.g., this will be a monitored TACAN approach/an ASR approach).
   b. Standard compass headings (and glideslope information for PAR) with trend information.

**Note**

PAR Target/Glide Path Standards are defined in ATC NATOPS (NAVAIR 00-80T-114).

c. When to make half-standard rate turns for a no-gyro approaches.

d. Range, course and glidepath (for PAR) position each mile on final.

e. During PAR approach, when aircraft is approaching glidepath (10 to 30 seconds prior to descent) and when pilot should begin descent.

f. During radar monitored TACAN approaches, state the minimum descent altitude (e.g., minimum descent altitude three seven zero).

g. During ASR approaches, provide descent guidance at 5 nm inbound.

**Note**

Per NATOPS Instrument Flight Manual (NAVAIR 00-80T-112) the pilot should establish a rate of descent which will ensure reaching the MDA at or before the MAP.

h. When to execute climbout procedure during practice approaches (e.g., at a one mile, execute climbout).

i. For helicopters, when aircraft reaches approach minimums and has not reported ship in sight (e.g., at approach minimums, if mother not in sight, execute missed approach).

8. If communications are lost while being vectored in the CCA pattern or during final approach, aircraft shall comply with lost communication procedures for LH-4.

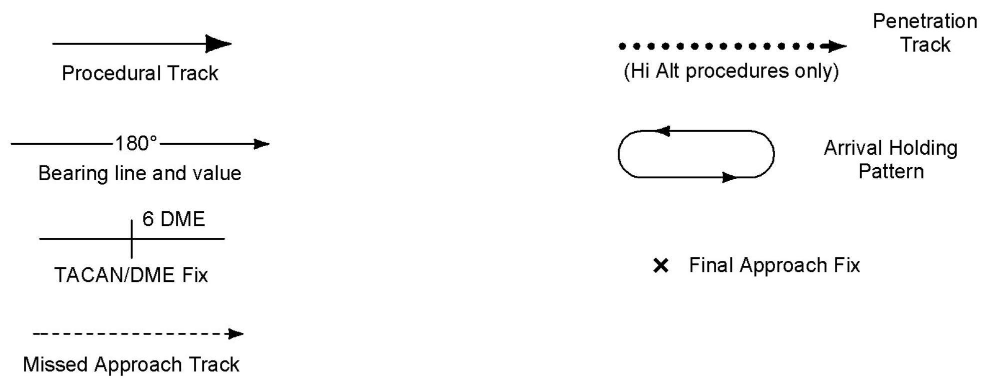
9. When non-radar instrument approaches are conducted for training or proficiency, PAR should be used for approach monitoring to the maximum extent possible.

Figure 7-6. Legend — Instrument Approach Procedure Charts

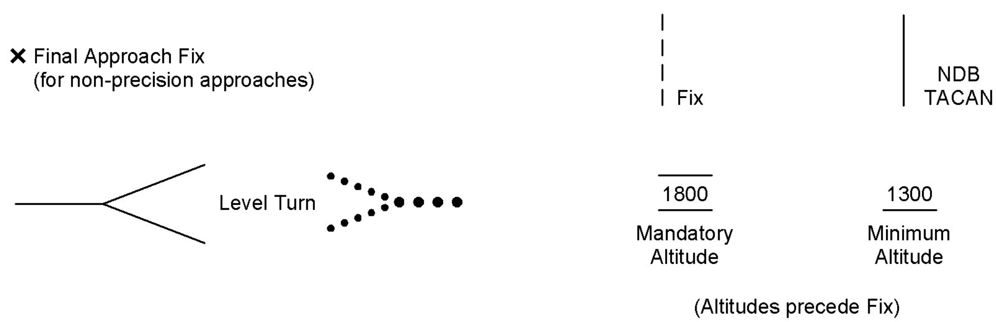
# LEGEND

## INSTRUMENT APPROACH PROCEDURE CHARTS

### PLANVIEW SYMBOLS




### PROFILE




### GENERAL INFORMATION & ABBREVIATIONS

**All distances and visibility data in nautical miles. All elevations in feet above MSL except weather ceiling data in feet above flight deck. All radials/bearings are magnetic.**

ASR .......... Air Surveillance Radar
BRC .......... Base Recovery Course (Mag hdg of ship)
CH .......... Channel
DH .......... Decision Height (for precision approaches only, i.e., **Precision Approach Radar**)
DME .......... Distance Measuring Equipment
FAF .......... Final Approach Fix
FB .......... Final Bearing
IAF .......... Initial Approach Fix
**ICLS .......... Instrument Carrier Landing System (SPN-41)**
MDA .......... Minimum Descent Altitude (for non-precision approaches only, i.e., ASR, TACAN, NDB)
MSL .......... Mean Sea Level
NDB .......... Non-directional Radio Beacon
PAR .......... Precision Radar Approach
TAC .......... TACAN

LHA-F013

### 7.8.2.8 Missed Approach Procedures

1. Unless otherwise directed, missed approach procedures for NDB/TACAN approaches shall be in accordance with procedures published on the applicable approach chart.

2. Unless otherwise directed, aircraft on radar approaches shall turn right 90° off the final bearing, climbing to 1,000 feet and await further instructions or vectors to the final approach course.

### 7.8.2.9 Helicopter Delta Procedures

During Case II/III marshal and letdown, should a "Signal Delta" be issued, the procedures listed below shall apply. Minimum Delta issued shall be 6 minutes and even (2) minute intervals thereafter. When time permits, AATCC shall give the reason for Delta.

1. Aircraft still in holding shall continue holding and await a new EAT. Pilots shall acknowledge "Signal Delta."

2. Aircraft that have already commenced approach shall continue on approach and await further instructions. Aircraft shall comply with speed and altitude restrictions for the appropriate approach, or with control instructions.

3. Aircraft that lose communications subsequent to receiving "Signal Delta" shall continue holding and depart marshal 6 minutes (or other assigned Delta) from receipt of Delta. They shall maintain altitude until clear of marshal and proceed to assigned emergency marshal, holding until assigned EEAT, and then comply with emergency marshal procedures.

4. New EATs shall be issued as soon as possible. To prevent two aircraft from having the same EAT, new times shall be issued from the top of the stack (highest aircraft in holding) to the bottom.

### 7.8.2.10 Approach Minimums

Approach minimums are depicted in Figures 6-13, 6-14, 6-15, 7-7, 7-8, and 7-9. Ships, embarked squadron commanding officers and detachment officers in charge may increase these minimums if required because of significant changes in operational capability such as decreased AATCC or embarked squadron proficiency. When a suitable divert field is available, aircraft shall not commence an approach if the reported weather at the ship is below minimums, unless the aircraft has sufficient fuel to proceed to the divert field in the event of a missed approach.

### 7.8.2.11 Helicopter Emergency Marshal

The purpose of emergency marshal is to provide an established procedure for aircraft returning with lost communications. Pilots shall be briefed on emergency marshal prior to initial takeoff. These procedures presume operational TACAN azimuth and DME. Aircraft with lost NAVAID and communication shall comply with lost NAVAID procedures below.

**WARNING**

LH-4 Marshal conflicts with emergency marshal pattern. Aircraft entering either pattern shall be vigilant for the presence of other aircraft.

LHA/LHD operations are unique in that helicopter final recovery times cannot be predicted because of mission status and hot refueling. It is necessary to establish emergency marshal procedures that will remain in effect throughout the aircraft's event and does not require an update if the aircraft hot refuels. The patterns and procedures depicted in Figure 7-9 provide for the recovery of 24 individual helicopters experiencing lost communications during IMC.

Each aircraft on the ship's air plan shall be assigned an emergency marshal point. Radial, DME, EEAT, and altitude are based on the marshal point assigned. The assigned point shall not be changed during the aircraft's event except as requested by AATCC or the pilot and only with the expressed approval of both parties.

The 24 emergency marshal points are positioned on three TACAN radials and eight DME fixes at eight altitudes. The system provides lateral, vertical, and time separation. Radials are labeled “A” through “C,” are 45° apart, and are relative to the EFB.

A helicopter experiencing lost communications in IMC shall proceed outbound from the ship climbing or descending to the assigned emergency marshal altitude, then proceed directly to the assigned emergency marshal.

During mixed operations helicopters shall remain outside of five miles at or above 2,200 feet when crossing the final bearing.

Helicopters shall squawk IFF code 7600. Holding pattern is a standard right-hand 2 nm racetrack with the outbound turn commencing over the assigned DME fix. Pilots shall maneuver to be at the assigned fix, at assigned altitude, at EEAT. At EEAT, commence descent to 500 feet and proceed inbound to the 5 DME arc. At the 5 DME arc, turn left arcing clockwise to the EFB. Proceed inbound on the EFB and commence descent to MDA at the FAF (3 DME) in accordance with Figure 7-9.

**Note**

Helicopter airspeed throughout the emergency marshal pattern is 90 knots except in holding when maximum fuel conservation airspeed shall be observed.

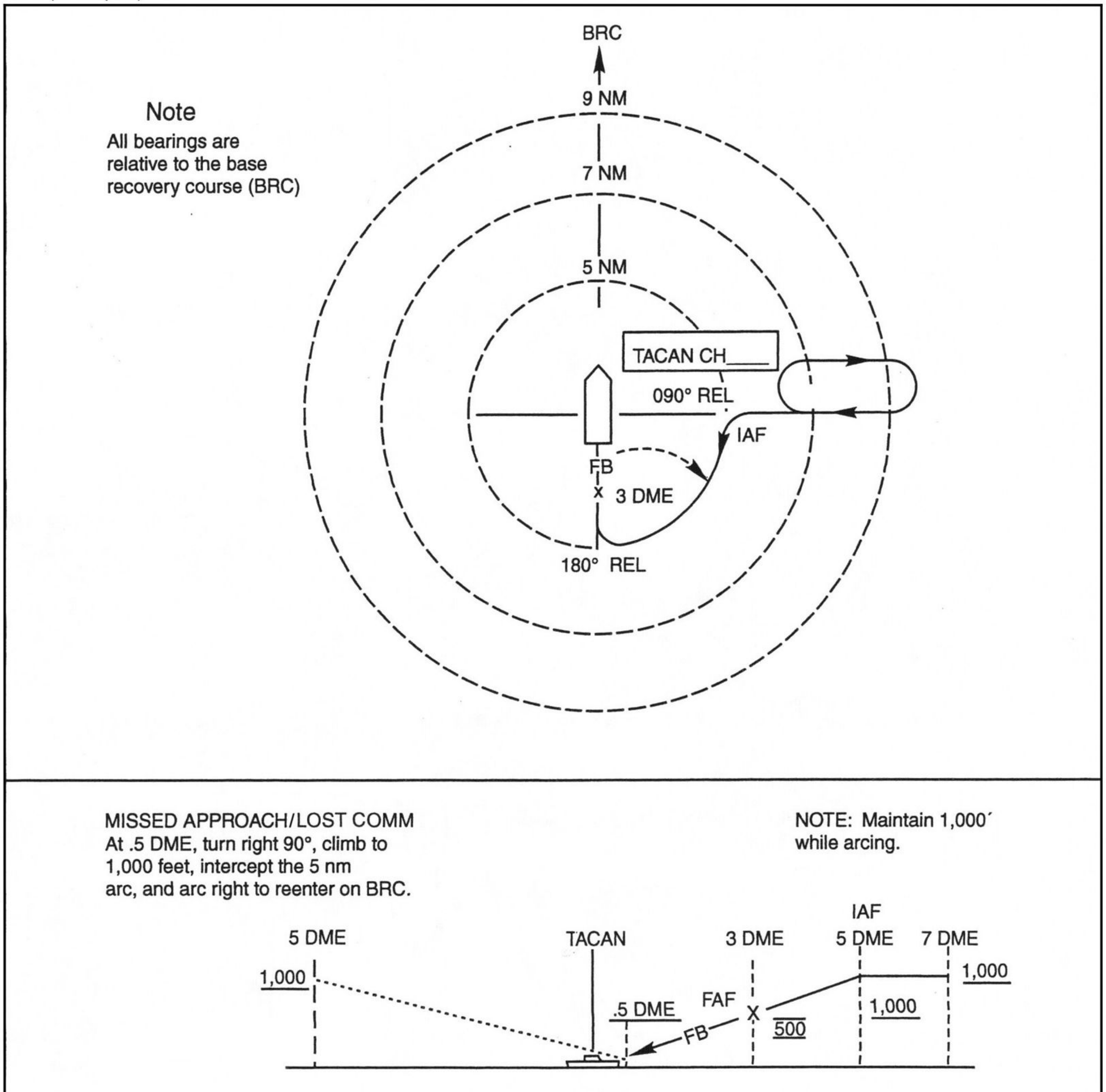
The emergency marshal pattern depicted in Figure 7-9 contains two sets of EEATs. When 16 or fewer aircraft are launched, the pattern repeats itself twice each hour. When more than 16 aircraft launch, the pattern repeats hourly.

**Note**

Emergency marshal patterns are designed for blue water operations. Proximity to land masses or control zones may necessitate modification of emergency marshal procedures as exact conditions cannot be predicted. It is incumbent on the ship’s air operations officer to assign emergency marshal patterns that do not conflict with aircraft, existing obstructions, or other patterns in use.

Figure 7-7. Approach Chart for LH-4 (Helicopter)

LH-4 (Helicopter) HELICOPTER

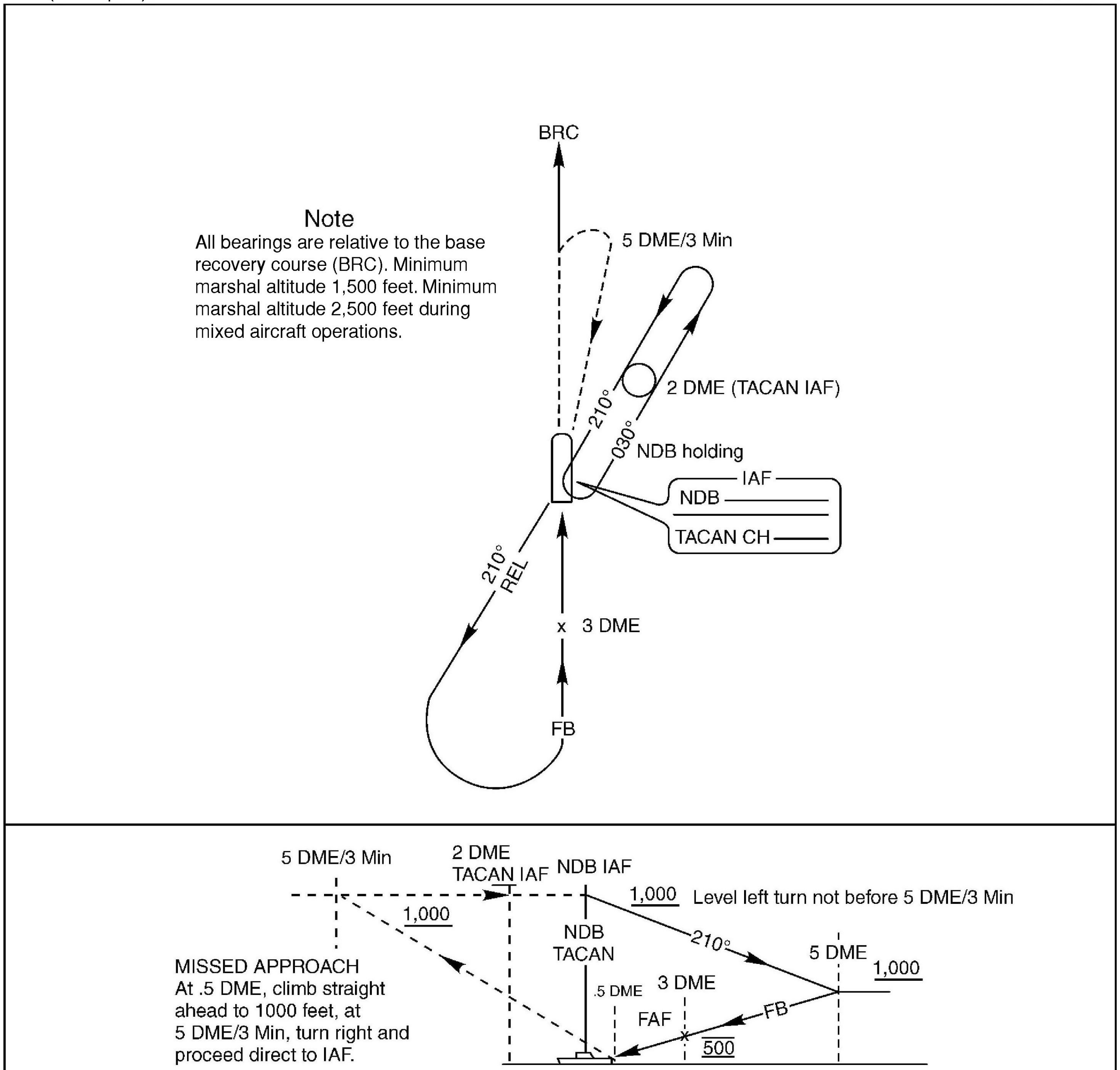



| Highest Obstruction — 200’ | Flight Deck Elevation — 70’ |
|---|---|
| | MDA or DH-Vsby, HAT, (Weather Minimum) |
| ASR/TACAN | 470-¾ 400 (400-¾) |
| PAR (AN/SPN-35) | 270-½ 200 (200-½) |

LHA/LHD

Figure 7-8. Approach Chart for LH-5 (Helicopter)

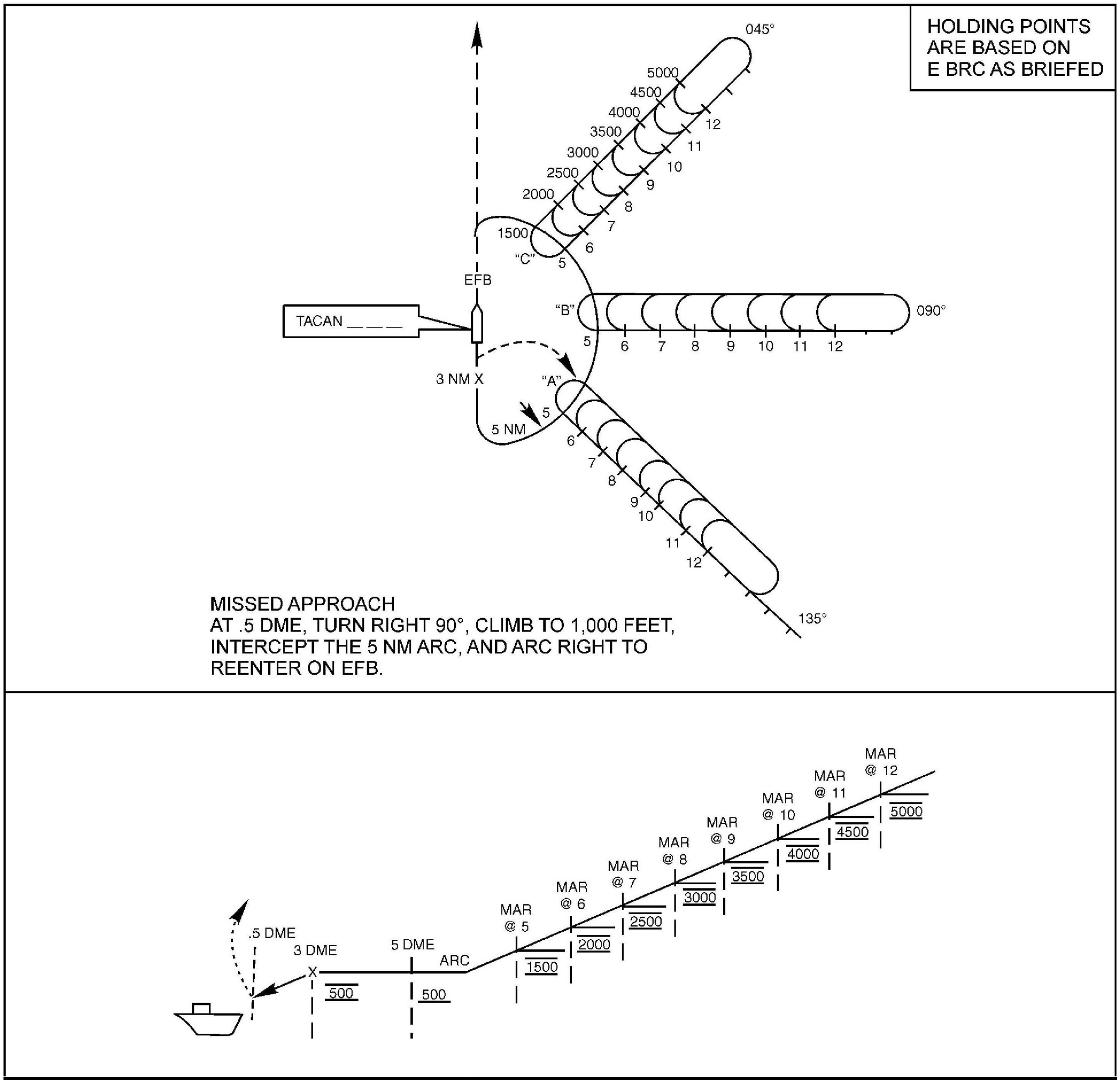
LH-5 (Helicopter) HELICOPTER




| Highest Obstruction — 200’ | Flight Deck Elevation — 70’ |
|---|---|
| | MDA or DH-Vsby, HAT, (Weather Minimum) |
| ASR/TACAN/NDB | 470-¾ 400 (400-¾) |
| PAR (AN/SPN-35) | 270-½ 200 (200-½) |

LHA/LHD

Figure 7-9. Helicopter Emergency Marshal Patterns




| Highest Obstruction — 200’ | Flight Deck Elevation — 70’ |
|---|---|
| | MDA or DH-Vsby, HAT, (Weather Minimum) |
| TACAN | 470-¾ 400 (400-¾) |

Figure 7-9. Helicopter Emergency Marshal Patterns (cont.)

| MARSHAL (MAR) ALTITUDES AND EMERGENCY EXPECTED APPROACH TIMES | | | | | | |
|---|---|---|---|---|---|---|
| | | | | EEAT (minutes past hour) (16 Helos) | | EEAT (minutes past hour) (24 Helos) |
| MARSHAL POINT | MARSHAL RADIAL (Rel Deg) | DME | ALT | 1st | 2nd | |
| A5 | 135 | 5 | 1500 | 00 | 30 | 00 |
| A6 | 135 | 6 | 2000 | 01 | 31 | 01 |
| A7 | 135 | 7 | 2500 | 02 | 32 | 02 |
| A8 | 135 | 8 | 3000 | 03 | 33 | 03 |
| A9 | 135 | 9 | 3500 | 04 | 34 | 04 |
| A10 | 135 | 10 | 4000 | 05 | 35 | 05 |
| A11 | 135 | 11 | 4500 | 06 | 36 | 06 |
| A12 | 135 | 12 | 5000 | 07 | 37 | 07 |
| B5 | 090 | 5 | 1500 | 13 | 43 | 13 |
| B6 | 090 | 6 | 2000 | 14 | 44 | 14 |
| B7 | 090 | 7 | 2500 | 15 | 45 | 15 |
| B8 | 090 | 8 | 3000 | 16 | 46 | 16 |
| B9 | 090 | 9 | 3500 | 17 | 47 | 17 |
| B10 | 090 | 10 | 4000 | 18 | 48 | 18 |
| B11 | 090 | 11 | 4500 | 19 | 49 | 19 |
| B12 | 090 | 12 | 5000 | 20 | 50 | 20 |
| C5 | 045 | 5 | 1500 | 21 | 51 | 26 |
| C6 | 045 | 6 | 2000 | 22 | 52 | 27 |
| C7 | 045 | 7 | 2500 | 23 | 53 | 28 |
| C8 | 045 | 8 | 3000 | 24 | 54 | 29 |
| C9 | 045 | 9 | 3500 | 25 | 55 | 30 |
| C10 | 045 | 10 | 4000 | 26 | 56 | 31 |
| C11 | 045 | 11 | 4500 | 27 | 57 | 32 |
| C12 | 045 | 12 | 5000 | 28 | 58 | 33 |

NOTES:
1. Proceed outbound from ship and climb/descend to assigned emergency marshal altitude.
2. Proceed direct to assigned emergency marshal fix.
3. During mixed operations, helicopters shall cross EFB at 2,000 feet or above.
4. Hold inbound, right turns, 2-mile legs. Report established, state, souls on board.
5. At EEAT, depart fix inbound, descend to 500 feet. Report departing, state.
6. At 5 DME, arc clockwise to intercept 180 degree relative radial, proceed inbound.
7. At FAF (3 DME), begin final descent. Report FAF, state.
8. Watch for light from tower, land on LSE’s signal.

## 7.9 HELICOPTER ORDNANCE RECOVERY

1. Clean or Unexpended Free Fall — Standard recovery as dictated by weather.
2. Hung Free Fall — Standard recovery as dictated by weather. Avoid overflight of all surface vessels.
3. Hung or Unexpended — Standard Alpha pattern (Figure 7-10) recovery as dictated by weather. Winds permitting, the nose of the helicopter should be pointed away from the island during landing. The helicopter shall be landed with the nose pointed away from the island or other aircraft. All nonessential personnel shall remain clear of the flight deck area during these evolutions.

**WARNING**

A helicopter equipped with forward firing ordnance attempting to land may inadvertently cross the safe parking line if landing is conducted with a combination of excessive right drift and left yaw.

## 7.10 ROTOR DISENGAGEMENT

Prior to disengagement or rotor shutdown, the LSE shall ensure that the signal to disengage is received from the flight deck supervisor who in turn receives the signal from the Air Officer. The LSE shall ensure that wheels are chocked, rotors are clear of personnel, and that tiedowns are properly installed.

**Note**

Landing gear, external auxiliary fuel tank, and ordnance safety pins shall be inserted prior to rotor disengagement and/or engine shutdown.

Helicopters should not disengage rotors while the ship is in a turn except when authorized by the ship's commanding officer or designated representative. Anticipated wind parameters and ship's heel shall be communicated to the aircraft commander prior to execution of the turn.

The pilot shall not disengage rotors until receipt of the signal from the LSE.

The Air Officer shall ensure that proper wind conditions exist for disengagement in accordance with applicable NATOPS manuals. If high wind conditions exist, rotor disengagements shall commence with the most forward aircraft and work aft.

**WARNING**

Reported wind as displayed in PriFly may vary greatly with existing wind over deck. Extreme care shall be exercised when engaging/disengaging rotors if other aircraft are launching or recovering.

The MFFV shall be manned until all aircraft are completely shut down.

## 7.11 HELICOPTER EMERGENCY PROCEDURES

### 7.11.1 Lost Communications During Approach

Aircraft which lose communications shall squawk IFF/SIF in accordance with Figure 4-4.

1. If VMC aircraft shall remain VMC and continue approach utilizing VFR lost communication signals listed in Figure 7-11.
2. If IMC/night and only communications failure occurs continue approach utilizing instrument approach lost communication procedures. Attempt to contact the ship using survival radio, time and safe control of aircraft

permitting. When visual contact with the ship is made, follow procedures listed in Figure 7-11. The ship shall respond with light signals as illustrated in Figure 7-11.

### 7.11.2 Complete Communications/Navigation Failure

1. Pilot of single aircraft may elect to continue approach by dead reckoning to MDA until at least 2 minutes past expected arrival time. Climb out on final bearing until VMC is achieved or at emergency marshal altitude if unable to maintain VMC. Fly appropriate triangular pattern (receive only, right-hand pattern; if no receive, left-hand pattern — “right receive, nothing left”) at altitude, conserve fuel, and expect joinup. Follow lead or, at pilot’s discretion, divert to divert field, fuel permitting. If below overcast, fly DR search pattern to locate ship. When visual contact with ship is made, follow procedures in Figure 7-11.
2. Pilot may elect to discontinue approach. Climb on the final bearing to VMC or emergency marshal altitude, using DR, and follow procedures listed in Figure 7-11.

**Note**

An aircraft with navigation and/or communication equipment inoperative that is in the company of, or joined by, an escort aircraft with navigation or communication equipment in working order shall be handled as a single flight in the recovery procedure. The escort aircraft becomes the flight leader and shall normally communicate with the distressed aircraft in accordance with standard aircraft NATOPS procedures. The distressed aircraft shall assume a position on the starboard wing of the lead aircraft. When the lead aircraft has the ship in sight, a lead change shall be visually communicated. The distressed aircraft shall complete a visual approach to landing. The escort aircraft shall enter the Charlie pattern for landing (helicopter) or continue upwind until vectored to downwind by AATCC. If conditions preclude continued flight in the Charlie pattern, escort aircraft shall climb on the BRC to 1 mile or 2 minutes and comply with missed approach instructions per applicable TACAN approach procedure or as directed by AATCC.

Figure 7-10. Alpha Pattern for Recovery of Armed Helicopters

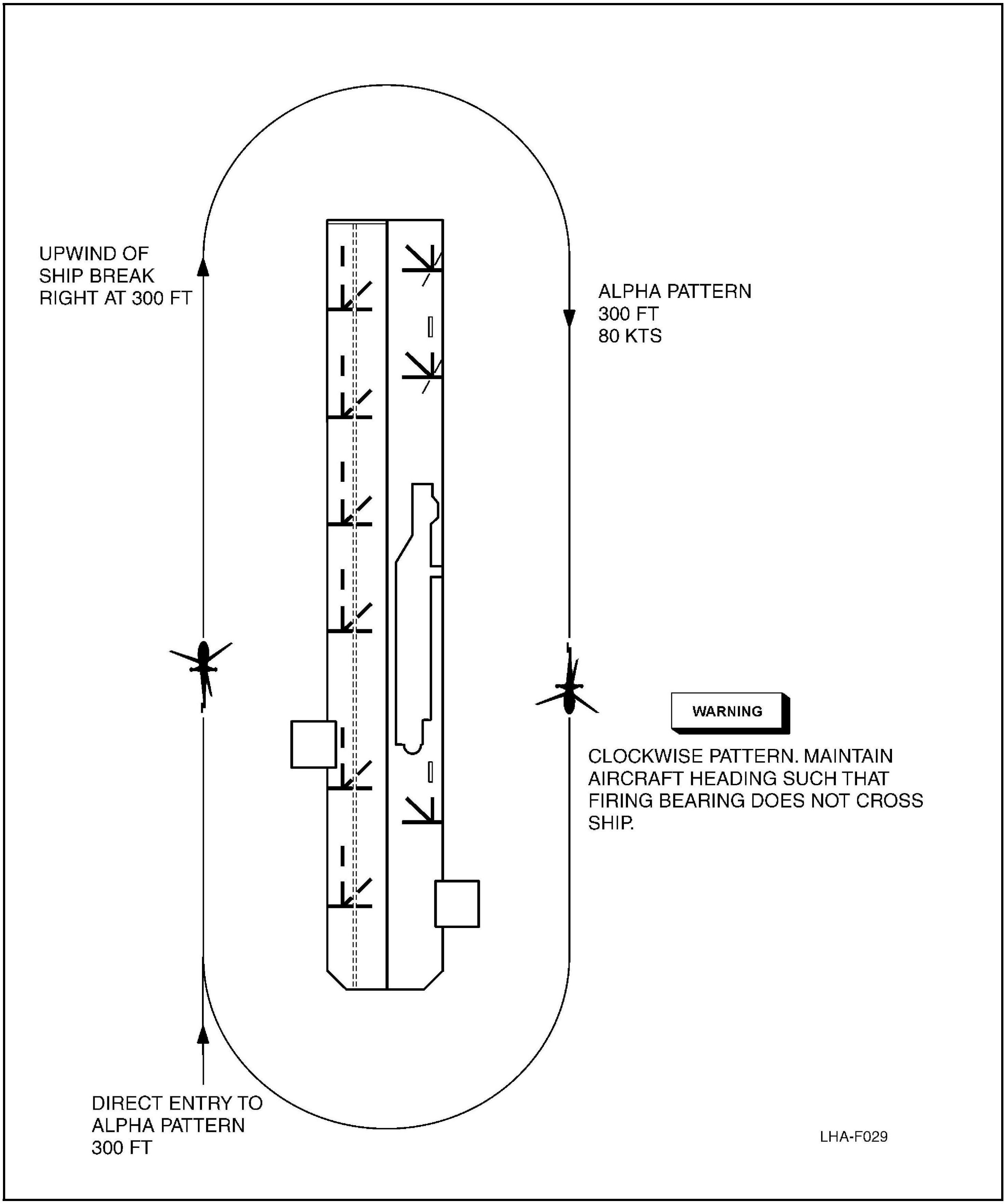


Figure 7-11. Helicopter/Tiltrotor Visual Signals During EMCON or Lost Communications

**FROM AIRCRAFT TO SHIP**

| PILOT'S DESIRES OR INTENTIONS | SIGNAL |
|---|---|
| 1. I require immediate landing. | Fly by or hover close aboard starboard quarter, remaining clear of other traffic, with gear DOWN and floodlight/landing light ON. With complete electrical failure, fire a red flare on a safe bearing away from the ship. |
| 2. I desire to land but can wait for the next recovery or scheduled recovery time. | Fly by or hover on the starboard side, low and close aboard with navigation lights BRIGHT and FLASHING and anticollision lights ON. With complete electrical failure, fire a red flare on a safe bearing away from the ship. |
| 3. I am proceeding to the divert field. | Fly up the starboard side of the ship, rocking wings with landing gear UP, navigation lights BRIGHT and STEADY and anticollision lights ON. If fuel state and the nature of the emergency permit, continue making passes until joined by a wingman. Upon reaching divert fuel state proceed alone, setting IFF to emergency when departing. |

**Note**

At night, aircraft flying close aboard the port side of the ship without lights are considered to have an emergency requiring immediate landing.

**FROM SHIP TO AIRCRAFT**

| | SIGNAL | | |
|---|---|---|---|
| **COMMAND/ADVISORY** | **OLS** | **ALDIS LAMP** | **BLINKER** |
| 1. †Bingo — Proceed to alternate landing field. | Flashing cut and waveoff lights. | Flashing Red light. | M, M<br>— —, — — |
| 2. Add power — (Jets and turboprops only). | Flash cut lights. | N/A | N/A |
| 3. Cleared to enter CHARLIE pattern. | N/A | Flashing Green. | N/A |
| 4. CHARLIE — Cleared to land aboard | N/A | Steady Green light. | C<br>—— • —— • |
| 5. DELTA — Delay in landing. Enter DELTA pattern and maintain visual contact with the ship. | Flashing landing area lights. | Steady Red light. | D<br>—— • • |
| 6. Closed deck. Do not land. | Landing area lights off (night only). | N/A | N/A |
| 7. Do not land. Ditch or bail out/eject in the vicinity of the ship. | N/A | Z<br>—— —— • • | Z<br>—— —— • • |
| 8. LSO has control of the aircraft on final approach at approximately 1−1/2 miles. | Steady (3 seconds) cut lights. | N/A | N/A |

Figure 7-11. Helicopter/Tiltrotor Visual Signals During EMCON or Lost Communications (cont.)

| FROM SHIP TO AIRCRAFT | | | |
| --- | --- | --- | --- |
| | SIGNAL | | |
| **COMMAND/ADVISORY** | **OLS** | **ALDIS LAMP** | **BLINKER** |
| 9. Lower wheels. | N/A | W<br>• —— —— | W<br>• —— —— |
| 10. Lower flaps. | N/A | F<br>• • —— • | F<br>• • —— • |
| 11. Jettison disposable fuel tank. | N/A | G<br>—— —— • | G<br>—— —— • |
| 12. Jettison ordnance. | N/A | Q<br>—— —— • —— | Q<br>—— —— • —— |
| † Signal is given only when ordered by the Air Officer. | | | |

# CHAPTER 8

# Tiltrotor Procedures

## 8.1 TILTROTOR SAFETY PRECAUTIONS

1. Personnel shall not be permitted to approach or depart a V-22 while starting engines.
2. Personnel required to be in the immediate vicinity of tiltrotors during engine start shall remain well outside of the rotor area.
3. Except in case of emergency, pilots shall not stop engines or fold rotor blades without proper clearance from the LSE.
4. Personnel required to be in the area of operating tiltrotor aircraft shall exercise extreme caution and observe the signals/directions of the LSE or combat cargo representative as appropriate.
5. The APU shall be continuously monitored by a qualified person whenever it is in operation.
6. V-22 and H-53 launch and recovery operations should not be conducted from spots immediately behind unsecured tail rotor aircraft. If V-22 or H-53 launch and recovery operations are required from spots immediately behind unsecured tail rotor aircraft, consideration should be given to securing the aircraft and blades with initial (four-point) tie downs and increasing the wind over the deck.
7. Rotors of all helicopters shall be spinning at or above 100% $N_r$ or folded and secured (crutched, if capable) if H-53 or V-22 flight operations are being conducted on an adjacent spot. All H-53 helicopters should be spinning at 100% $N_r$, folded, or tied down if V-22 or H-53 flight operations are being conducted to the spot forward of its position.
8. Tiltrotors landing behind engaged tail rotor aircraft shall not conduct cross-cockpit takeoffs or landings for LSE safety.
9. During tiltrotor vertical operations, ensure that aircraft and equipment are parked starboard of the solid yellow V-22/H-53 Safe Parking Lines for the spot in use.
10. During tiltrotor STO/taxi operations ensure that aircraft and equipment are parked starboard of the alternating yellow and white V-22 STO Taxi Safe Parking Line.
11. There are no deck markings to indicate safe parking areas for V-22s operating in areas other than defined port side landing spots. When taxiing a V-22 forward from any position aft of spot 5, extreme care must be taken to ensure clearance from aircraft and equipment parked starboard of the alternating red and white fixed wing safe parking line. Aircraft and equipment shall be parked as far starboard as possible when V-22s are operating along the port side line up line.

**WARNING**

- When a V-22 or H-53 is vertically launching or recovering on spot 2, 4, 5, 7, or 9, aircraft and equipment parked beyond the solid yellow V-22/H-53 Safe Parking Lines may not have sufficient clearance, resulting in possible aircraft damage and injury to personnel.
- Aft of spot 5, safe parking lines do not ensure adequate separation during V-22 taxi evolutions. Failure to ensure proper clearance during taxi evolutions may result in aircraft damage and injury to personnel.

CAUTION

- When launching/recovering, damage from downwash to aircraft stowed abeam the spot in use may occur even when folded, crutched, and properly secured.
- Combination of relative winds and rotor downwash when landing a helicopter/tiltrotor immediately adjacent to a spot occupied by a shutdown helicopter, not folded and secured, may cause rotor system damage to the shutdown helicopter.
- Rotor blade tiedowns alone may not be sufficient to preclude rotor blade flapping and subsequent damage.
- In situations where a V-22 is landing in front of a spread helicopter, the risk for rotor blade damage increases with port winds over flight deck.

## 8.2 GROUND OPERATIONS

### 8.2.1 APU Start

When aircraft are spotted on the flight deck, pilots shall proceed with the prestart procedures and signal the LSE/director when ready to start the APU.

The LSE/director shall request clearance for APU start from the Air Officer in PriFly via the flight deck supervisor. PriFly shall display a red rotating beacon and announce the following over the 5 MC: “Check chocks, tiedowns, fire bottles, and all loose gear about the flight deck, helmets buckled, goggles down, start APU/APP/GTS on LSE/director signal.”

The LSE/director shall relay the clearance to aircrew before APU start can be initiated. APU starts may be requested while aircraft are in the parking area (slash/bone). Radios shall be turned on and set to land/launch frequency as soon as practicable after the APU is started. The MFFV shall be manned for all APU or main engine starts to include maintenance turns and engine wash/rinse procedures.

### 8.2.2 Towing

The V-22 uses either the APU or the backup brake pump to power the aircraft brake system during towing. When time is a critical factor, starting the APU in the slash/bone to initialize aircraft systems prior to spotting allows for reduced spot to launch times for the V-22. V-22 aircraft shall not be towed when wind over deck exceeds 35 knots.

CAUTION

Towing the V-22 when wind over deck exceeds 35 knots may result in damage to the aircraft and/or tow equipment.

### 8.2.3 Wing Spread/Blade Spread

All wing spreads/blade spreads shall be done only with approval of ACHO or designated representative. The pilot shall request and must be granted clearance before wing spread/blade spread can be attempted. Wings/blades shall not be spread while the aircraft is under tow or being pushed. PriFly shall ensure relative winds are within aircraft limitations prior to blade spread. The maximum non-turbulent winds relative to the helicopter shall be less than 45 knots from any quadrant.

### 8.2.4 Starting Engines

When ready to start engines, the pilot shall request clearance from the LSE/director by a raised hand displaying one or two fingers to indicate the desired engine to start. The LSE/director shall request clearance from PriFly via the flight deck supervisor. PriFly shall ensure that winds are within limits for start/engagements, display a red rotating beacon (amber for skid-configured helicopters and V-22), and then announce clearance for engine start over the 5 MC circuit. Upon signal from the LSE/director the pilot shall start engines.

The V-22 may start and wash one engine at a time in the Blade Fold/Wing Stow (BFWS) configuration, either on spot or in the slash/bone if nacelle exhaust is the appropriate distance from other aircraft/structures in accordance with the V-22 NATOPS.

When the aircraft is in Flight Ready mode, engines start and rotor engagement is simultaneous. The V-22 does not have the capability to start the engines and then engage the rotors.

### 8.2.5 Maintenance Ground Turns

The V-22 routinely requires maintenance ground turns. Maintenance ground turns on an assigned spot do not allow access to the left nacelle for inspection or troubleshooting. When left nacelle access is required, spotting between spots 6 and 7 (with left nacelle over the port elevator) is preferred. If this is not possible, aircraft may be ground turned perpendicular to the longitudinal axis of the ship, i.e. aircraft pulled straight out of forward or aft slash/bone for ground turn.

### 8.2.6 Taxi

Shipboard taxi may be utilized for flight operations with the following exceptions:

**Note**

To ensure adequate proprotor tip clearance with the island, self-taxi past the island shall be conducted with the nosewheel traveling along the port side spot's longitudinal lineup line.

1. Backwards taxi shall not be conducted shipboard.
2. Shipboard taxi authorized for ship roll ≤ 5 degrees.

Taxiing aboard ship must be conducted under the positive control of an aircraft director. Any signal from the aircraft director above the waist is intended for the pilot and any signal below the waist is intended for deck handling personnel. The aircraft director signals shall be followed explicitly with large and immediate directional pedal inputs when directed. Aircraft may be taxied while the ship is in a turn as long as ship roll remains within limits specified above.

When taxiing aboard ship, the preferred technique for controlling speeds is to set a constant nacelle angle and modulate brake pressure. This minimizes pilot workload and avoids taxi speed variations due to ship motion.

Prior to removal of chocks and chains, the aircraft shall have both engines operating, AFCS on, and be flight ready with takeoff and lineup checks complete. Pilots shall monitor land/launch frequency during taxi. Personnel with chocks and chains shall be readily available during aircraft taxi. These personnel shall remain far enough away from the aircraft to allow for immediate takeoff. However, upon signal from the LSE they will be prepared to immediately install chocks and chains.

After the taxi is complete, the pilot shall center the nose landing gear. The aircraft director shall signal the pilot that the nose gear is centered, before chocks and chains are installed.

### 8.2.7 Deck Heating Mitigation

1. With an operable coanda exhaust deflector system, on-deck idling ($N_r$ = 75%) on all LHA/LHD type ships is acceptable using the following 10/15 minute nacelle modulation technique:

   a. Within 10 minutes of landing or engine start, nacelles shall be rotated to 70 degrees for 15 minutes. Nacelle angle shall then be alternated between 97 and 70 degrees, remaining at 97 degrees for 10 minutes and 70 degrees for 15 minutes.

b. For launch evolutions, if aircraft has not launched within 10 minutes of setting the 90 or 97 degree position, nacelles shall be rotated to the 70 degree position for a minimum of 5 minutes immediately prior to setting nacelle angle for aircraft launch.

2. With an inoperable coanda exhaust deflector system on the over-deck engine, launch aircraft or shut down over-deck engine within 5 minutes of engine start or landing.

3. With an inoperable coanda exhaust deflector system on the over-water engine, aircraft shall launch or shut down over-water engine within 5 minutes of engine start or landing. If aircraft remains on deck, aircraft shall shut down over-deck engine within 10 minutes of engine start or landing.

4. Special procedures are recommended with respect to V-22 ground and maintenance turns when the aircraft may be off-spot or at other-than-longitudinal orientations. V-22 maintenance or ground turns where $N_r$ is maintained at or below 84% are acceptable for up to 30 minutes. Maintenance or ground turns where $N_r$ is maintained over 84% for greater than 10 minutes requires the use of portable V-22 heat shields under over-deck engine(s).

5. For LHA 6 and LHD 1 type ships that have received SCD 12042 (F-35B Flight Deck Structural Modifications), the above V-22 ground and maintenance turn procedures do not apply at Spots 7 and 9.

**CAUTION**

V-22 high exhaust temperatures can cause long term fatigue damage to deck plating. Failure to follow deck heating mitigation procedures may result in permanent damage to the flight deck.

## 8.3 LAUNCHING AIRCRAFT

Tiltrotor aircraft launch in accordance with tiltrotor specific procedures detailed in this paragraph.

**WARNING**

- Reported winds as displayed in PriFly may vary greatly with existing winds over the deck.
- Failure to provide requested optimum winds severely impacts aircraft performance, increases risk, limits pilot’s options and may contribute to loss of aircraft, injury or death.
- Rotor downwash created by the H-53 and the V-22 is sufficient to damage spread helicopter rotor blades and blow aircraft chocks, tie down chains, and towbars about the deck or overboard, and cause personnel injury or death.
- H-53 and V-22 launch and recovery operations directly behind any unsecured light to medium lift tail rotor helicopter may cause uncommanded yaw of the forward helicopter due to H-53 and V-22 downwash resulting in possible aircraft damage and/or personnel injury or death.

CAUTION

- When launching/recovering, damage from downwash to aircraft stowed abeam the spot in use may occur even when folded, crutched, and properly secured.
- Combination of relative winds and rotor downwash when landing a helicopter/tiltrotor immediately adjacent to a spot occupied by a shutdown helicopter, not folded and secured, may cause rotor system damage to the shutdown helicopter.
- Rotor blade tiedowns alone may not be sufficient to preclude rotor blade flapping and subsequent damage.
- In situations where a V-22 is landing in front of a spread helicopter, the risk for rotor blade damage increases with port winds over the flight deck.
- Extended hovering (e.g. fast roping) of V-22 or H-53 aircraft in proximity to any aircraft, even when rotor blades are folded and crutched and stabilator (if installed) folded, may result in damage to aircraft and equipment.

**Note**

In the event of a V-22 requiring respotting in the flight ready position, the aircraft can be towed and manually folded, if required. Other aircraft can launch and recover on spots forward and aft of a V-22 in all Blade Fold/Wing Stow (BFWS) configurations.

### 8.3.1 Preparation for Takeoff

The pilots shall communicate to the Squadron Representative or PriFly their desired mode of takeoff, either Vertical Takeoff (VTO) or Short Takeoff (STO). PriFly will communicate to the pilots and the deck crew the intended type of takeoff or taxi/takeoff for the tiltrotor(s) in question. If the tiltrotor is to taxi, and after pretaxi checks are completed internal to the aircraft, the pilots will indicate to the LSE that they are ready to taxi by giving the signal to lower nacelles for ground taxi. LSEs will echo the signal and pilots will lower the nacelles to 80°. The LSEs, upon receiving clearance from the Flight Deck Supervisor, will signal the pilots to release brakes and taxi for respot or to a STO position. When the tiltrotor reaches its intended spot, the LSE will signal the pilots to stop. The pilots will either reset the nacelles to 90° if a VTO is intended, or will lower the nacelles in preparation for clearance to STO. For aircraft scheduled for Fleet Logistical Support or mission tasking, a STO is the preferred takeoff method.

**Note**

- More than one tiltrotor can taxi at a time, but consideration should be given to allowing a one-spot distance between aircraft that are moving simultaneously.
- The tiltrotor may taxi while the ship is in a turn as long as the pitch and roll remain within the V-22 NATOPS limits.
- While V-22 is on deck with rotors turning, an upwind rotorcraft's downwash during launch or recovery can impinge upon the on-deck V-22 resulting in an uncommanded roll. Pilots should always be attentive during the launch and recovery of rotorcraft on forward spots and be prepared to make appropriate lateral stick inputs to counter uncommanded roll.

The V-22 may taxi with other aircraft launching or recovering to/from spots aft of the aircraft taxiing. The taxiing aircraft shall not be less than one spot ahead of any aircraft launching or recovering.

The V-22 may taxi with other aircraft launching, recovering or STO to/from spots forward of the aircraft taxiing with the following restrictions. A V-22 taxiing shall not be less than one spot behind any aircraft launching, recovering or STO and in accordance with spot separation limitations in Paragraph 5.5.1 and V-22 NATOPS.

V-22 shall not taxi between spot 9 and 7 with a spread V-22, H-53 or any aircraft launching or recovering on spot 8. A V-22 shall not taxi between spot 4 and 2 with a spread V-22, H-53 or any aircraft launching or recovering on spot 3.

V-22 may spot and turn up on the starboard side when facing athwartships.

Tiltrotors may be spotted or “stacked” via taxi in preparation for STO at intervals closer than provided by the established spots anywhere along the portside helicopter spot longitudinal line up line. By virtue of having their proprotors positioned laterally rather than fore-and-aft, tiltrotors can be spotted or stacked with an interval of 15 feet between the nosecone and the trailing edge of the empennage. The stacked position has insufficient clearance for VTO, but the tiltrotors can be subsequently separated from the stack for VTO if desired. A one-spot distance is required between the STO aircraft and the next aircraft in the stack.

**CAUTION**

- Care should be taken when spotting or stacking V-22s to avoid damage from engine exhaust to antennas and radomes.
- V-22 high exhaust temperatures can cause long-term fatigue damage to deck plating. Failure to follow Deck Heating Mitigation procedures (Paragraph 8.2.7) may result in permanent damage to the flight deck.

### 8.3.2 Vertical Takeoff/Landing (VTOL)

Tiltrotors can launch and recover vertically in much the same manner as other rotorcraft. V-22 lateral positioning is more critical than longitudinal positioning. LSEs and pilots should pay particular attention to “side to side” but should accept some variance in “fore and aft.”

### 8.3.3 Short Takeoff

Tiltrotors can launch via the bow with a short takeoff (STO). A STO permits the tiltrotor to launch at higher weights and/or with higher pressure altitudes and temperatures than would otherwise be possible with a VTO. That, coupled with a much quicker arrival at a safe single engine fly-away speed, make the STO the preferred launch method for tiltrotors. Positioning for STO shall be in accordance with the individual tiltrotor NATOPS manual. V-22 STO are prohibited when V-22 or H-53 aircraft are spread or turning on spots 1 or 3, and are prohibited with any aircraft occupying spot 2. During STO operations, aircraft and equipment shall be parked starboard of the alternating yellow and white V-22 STO Taxi Safe Parking Line.

Aircraft that depart via STO may not have the power to conduct a rapid land-back via vertical landing. PriFly should be prepared to clear aft spots in a short time for a high gross weight or emergency low-speed no hover landing to the aft spots. In addition, no hover landings to the stern, as a normal method of recovering tiltrotors, decrease deck cycle times. No hover landing speeds and procedures will be conducted in accordance with the individual tiltrotor NATOPS.

The tiltrotor will either arrive at the STO position at the completion of a taxi, or will initiate the STO sequence from a VTOL nacelle position. If the tiltrotor arrives to the STO position at the completion of a taxi, the pilot will simply lower nacelles to the STO position and wait for the STO signal given by the LSE. The LSE will touch the deck and point in the direction of STO, much as is the procedure for fixed-wing launch. If the tiltrotor starts from the VTOL nacelle position, the pilots will advise PriFly that they are ready for STO and will give the LSE the “nacelles forward” signal. The pilots will then wait for the STO signal given by the LSE who received clearance from PriFly.

1. V-22 LSE:
   a. Inspect aircraft, verify nosewheel centered.

b. Thumbs up, salute — pilot salutes.

c. Pause, clear deck — launch.

**WARNING**

Aircraft or equipment parked beyond the alternating yellow and white V-22 STO Taxi Safe Parking Line are not assured of adequate separation from STO operations resulting in possible damage to aircraft and injury to personnel.

## 8.4 TILTROTOR DEPARTURE PROCEDURE

Tiltrotor aircraft execute fixed-wing Case I, II, and III departure procedures. Fixed wing procedures are the standard for tiltrotor departures; however, when mission, weather, or other conditions dictate tiltrotor aircraft may execute departure in accordance with helicopter procedures. The standard rendezvous for a three aircraft or larger flight is the Carrier Catch/Spin Rendezvous.

### 8.4.1 Case I Departure

Case I procedures shall be in accordance with fixed-wing procedures, Paragraph 6.5.2.

### 8.4.2 Case II Departure

Case II procedures shall be in accordance with fixed-wing procedures, Paragraph 6.5.3.

### 8.4.3 Case III Departure

Case III procedures shall be in accordance with fixed-wing procedures, Paragraph 6.5.4.

## 8.5 RECOVERY PROCEDURES

### 8.5.1 Marshal

Tiltrotor aircraft execute fixed-wing Case I, II, and III marshal, arrival, and approach procedures. Fixed wing procedures are the standard for tiltrotor arrival, marshal, and approach; however, when mission, weather, or other conditions dictate tiltrotor aircraft may execute in accordance with rotor-wing procedures. Execution of rotor-wing procedures must be coordinated through AATCC (unless previously coordinated) and aircraft must be established at rotor-wing altitudes prior to 12 DME to deconflict with fixed wing arrivals and marshal unless under positive control. Tiltrotor aircrew specifically requesting to fly helicopter procedures shall fly at airspeeds consistent with helicopter operations.

Tiltrotor holding airspeeds will be in accordance with NATOPS standards. Due to the unpressurized cabin of the aircraft, holding altitudes should be limited to a maximum of 10,000 feet MSL.

### 8.5.2 Approach Procedures

Positive control shall be provided by AATCC from letdown through final approach until the flight leader/pilots reports ship in sight and requests to proceed visually.

For instrument approaches, tiltrotors convert and conduct landing checks at approximately 3 nm prior to FAF. At the completion of the approach, tiltrotors either conduct a straight in landing over the stern or sidestep to fly up the port side of the ship to intercept a 45 degree lineup.

**Note**

For practice approaches, and with approval by AATCC, tiltrotors may remain in airplane mode on final.

### 8.5.3 Break

In accordance with fixed-wing (Paragraph 6.5.2.1) and Figures 8-1, 8-2, or 8-3.

### 8.5.4 Tiltrotor Recovery Procedures

Execution of the Charlie pattern shall be in accordance with Figures 8-1, 8-2, or 8-3. A "Charlie" will be given with the anticipation that the first aircraft will be cleared to land upon arrival. When "Charlie" spot number is given, the aircraft is cleared to land. In conjunction with "Charlie", PriFly shall also broadcast the BRC, altimeter, and wind condition across the deck.

CQ operations are promulgated in the MV-22 T&R Matrix and are not seat dependent. The pilot shall inform tower when gear are down and seat position of pilot flying. LSEs shall pick up landing helicopters at the 45° position in the approach turn of the Charlie pattern or at 0.1 nm astern for stern landings.

Launch and recovery of other aircraft when a V-22 has rotors turning on deck is authorized as shown in Appendix E, Figure E-2.

### 8.5.5 Landing

**WARNING**

- Reported winds as displayed in PriFly may vary greatly with existing winds over the deck.
- Failure to provide requested optimum winds severely impacts aircraft performance, increases risk, limits pilot's options and may contribute to loss of aircraft, injury or death.

#### 8.5.5.1 Tiltrotor Alternate Approach Technique A

On approach to port spots of LHA and LHD ships in port winds, an alternate approach technique of aligning the aircraft's heading with the ship's heading early during final approach may be used to alleviate pitch-up with sideslip.

#### 8.5.5.2 Tiltrotor Alternate Approach Technique B

On approach to port spots of LHA and LHD ships in starboard winds, an alternate approach technique of delaying aircraft heading alignment with ship's heading until crossing the deck edge may be required to avoid/reduce tendency for uncommanded pitch-up.

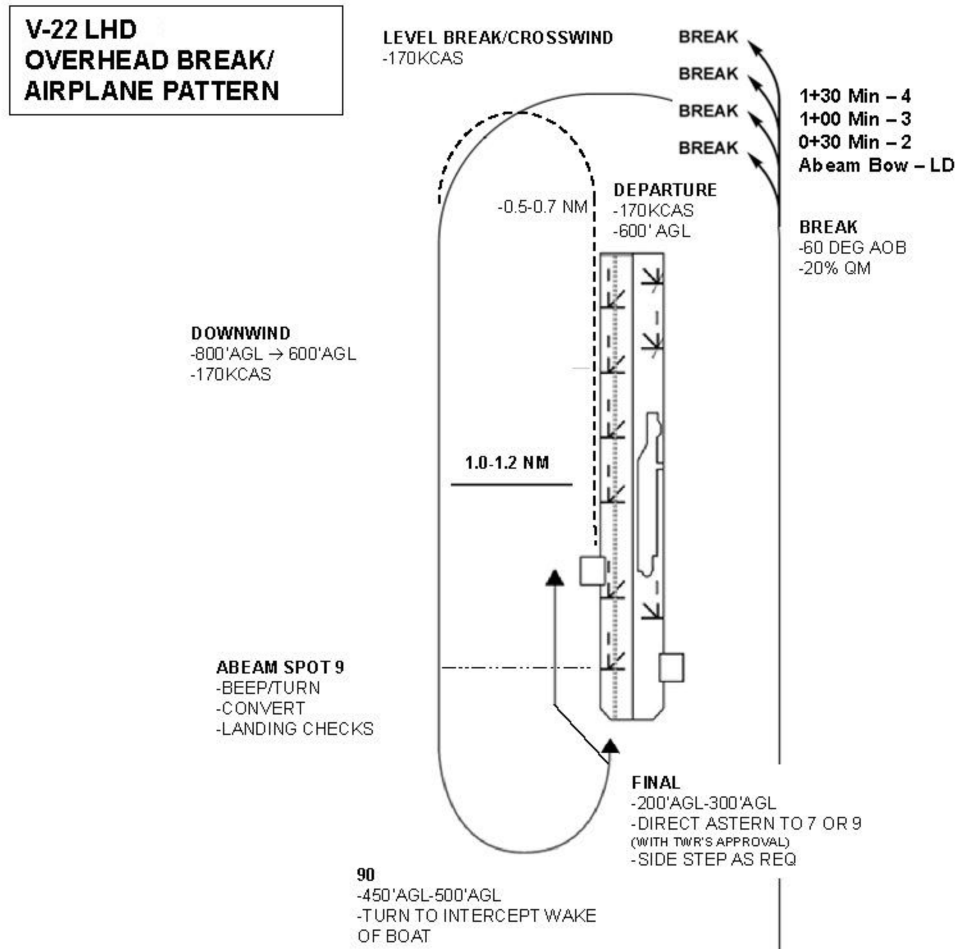
#### 8.5.5.3 Straight in Approach

A straight in approach over the stern of the ship to spot 9 is the preferred landing from an approach for a full stop/shut-down. If recovering multiple aircraft, immediately upon landing the aircraft should taxi forward as directed by the LSEs for shut down.

**Note**

A straight in approach, when directed, shall be initiated at a sufficient distance astem for the aircraft to be established positively on glideslope and airspeed at a minimum distance of 1 mile and altitude of 400 feet.

Figure 8-1. V-22 LHD Overhead Break/Airplane Pattern




| FUEL REQUIRED AT INITIAL/IAF | | |
|---|---|---|
| DAY CASE I (Initial) | FUEL REQUIRED | LAND TIME DELTA (ALL A/C AT INITIAL 4 MINUTES PRIOR) |
| LEAD | 250 lbs | 0 MIN (4 MIN AFT INIT) |
| -2 | 300 lbs | +1 MINUTE |
| -3 | 350 lbs | +2 MINUTES |
| -4 | 400 lbs | +3 MINUTES |

Figure 8-2. Overhead Break Timing Technique (Direct to Spot)

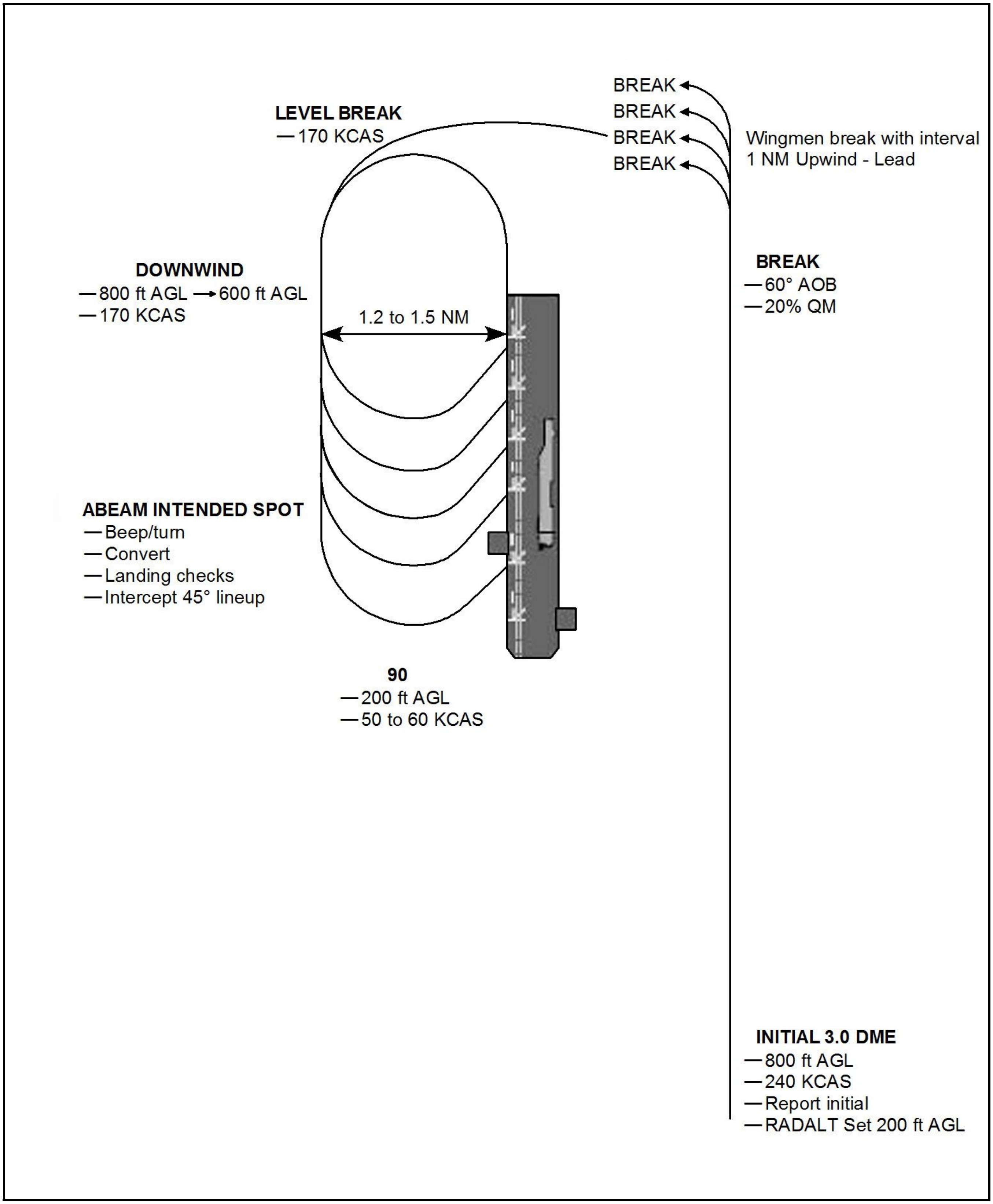
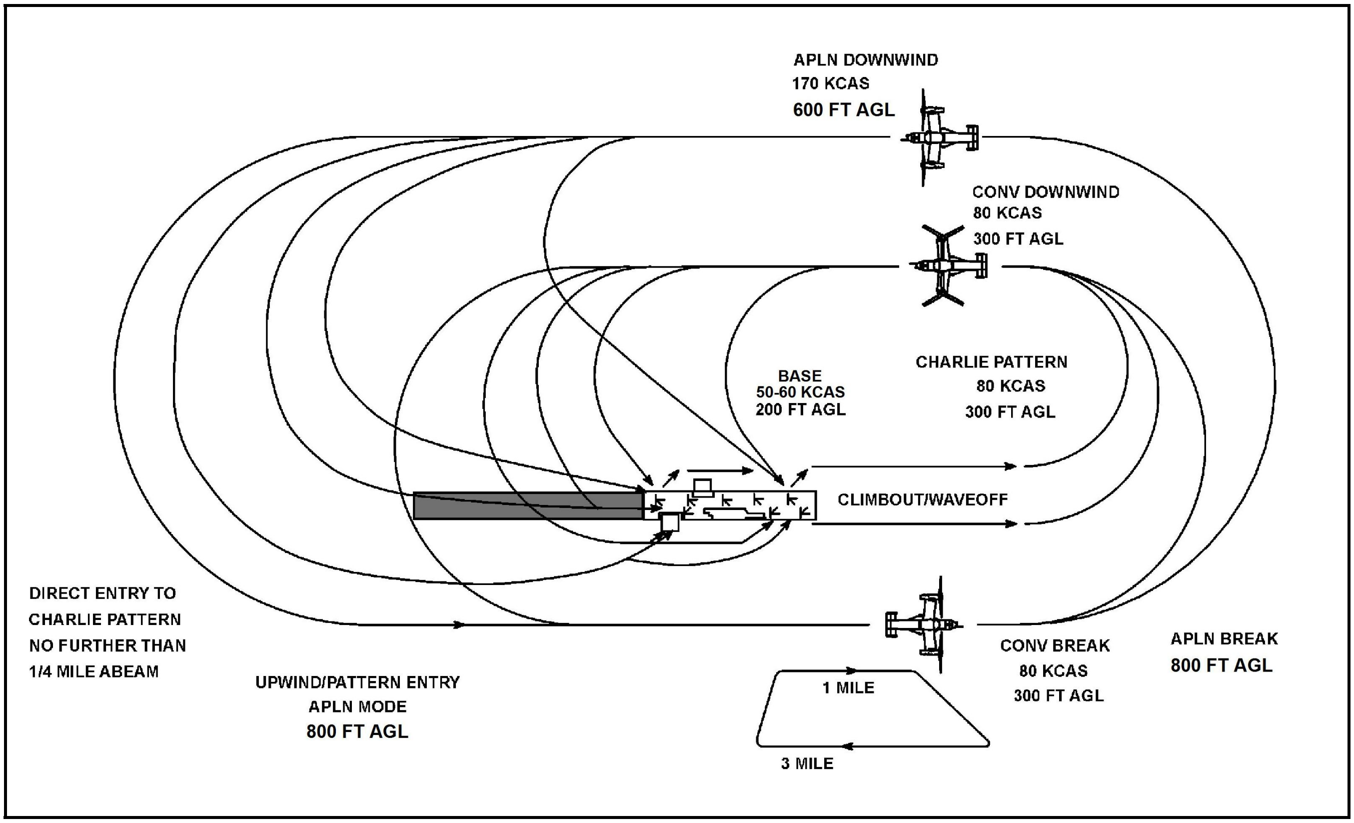


Figure 8-3. LHA/LHD Launch and Recovery Pattern




### 8.5.5.4 Waveoff

A waveoff shall be executed in the following situations:

1. Upon voice command from PriFly or loss of communication with PriFly.
2. Upon command from the LSE.

**Note**

LSE signals are advisory in nature except for "Waveoff" and "Hold," which are mandatory.

3. Upon loss of visual contact with LSE during final approach.
4. Any time the aircrew feels the approach cannot be safely completed.

Pilots shall report "(aircraft identification), waving off" and parallel the BRC on the appropriate side of the ship and reenter the appropriate Case I pattern. Should reentry into the Case I pattern not be possible, the aircraft shall climb straight ahead and request instructions from PriFly.

## 8.6 ENGINE SHUTDOWN

Chocks and tiedowns shall be applied after landing upon signal from the LSE and with the concurrence of the aircraft commander, and shall remain attached until the aircraft is ready for launch. During short duration on-deck times, such as when rapidly loading troops or supplies, the aircraft may be chocked only. Tiedowns shall be installed in compliance with individual aircraft NATOPS flight manuals. Unless otherwise specified in aircraft NATOPS flight manuals, tie-downs shall be attached to mooring rings in the vicinity of the main landing gear first.

Prior to engine shutdown, maintenance crews normally enter the rotor arc to conduct an engine wash in accordance with the MV-22B NATOPS checklist. Following this, the aircraft commander will request Amber Deck for their applicable spot and conduct engine shutdown (rotor disengagement is simultaneous with the engine shutdown).

## 8.7 EMERGENCY PROCEDURES

### 8.7.1 Emergency Marshal

Aircraft will comply with all fixed wing procedures (Fixed-Wing Emergency Marshal Paragraph 6.5.10.1, and Emergency Approach Paragraph 6.5.10.5). If navigational equipment is available, lone aircraft will continue approach. Pilot may utilize emergency survival radio on guard (243.0) frequency if time and safe control of aircraft permit.

### 8.7.2 Emergency Landing

In the event of an emergency, V-22 aircraft will expect to conduct a vertical landing or roll-on landing to spot 9. If unable to perform a vertical landing, the Air Officer should direct the bridge to make minimum WOD of 25 kts and clear as much deck space as possible for an emergency landing to the stern of the ship.

### 8.7.3 Lost Communications

Aircraft which lose communications shall squawk IFF/SIF in accordance with Figure 4-4.

1. If VMC, aircraft shall remain VMC. If able, delta overhead ship while waiting for the assigned Charlie time. Utilize VFR lost communication signals listed in Figure 7-11.
2. If IMC/night and communications failure occurs, attempt to contact the ship using survival radio, time and safe control of aircraft permitting. If contact cannot be established, enter the emergency marshal pattern as assigned. Commence the emergency marshal TACAN approach at the EEAT.

When visual contact with the ship is made, follow procedures listed in Figure 7-11. The ship shall respond with light signals as illustrated in Figure 7-11.

CHAPTER 9

# Aircraft Handling Procedures

## 9.1 GENERAL REQUIREMENTS

All aircraft movement shall be controlled by qualified aircraft directors. Aircraft shall be moved only with the express authority of the ACHO or designated representative. Aircraft handling personnel shall report to higher authority any observed unsafe practices or any condition that may affect the safety of personnel or equipment.

When the ship is at flight quarters, the OOD shall ensure that all anticipated turns are coordinated with PriFly so they may be announced over the 5MC as appropriate. When PriFly is not manned, the OOD shall contact flight deck control to coordinate all anticipated turns.

The ACHO shall begin a respot early enough to avoid unnecessary haste; however, when aircraft are airborne, the desirability of maintaining a ready deck for as long as possible should be a consideration. The tempo of aircraft movements shall be governed by the deck stability, prevailing winds, weather conditions, and nonskid conditions. Primary consideration shall be given to safety of personnel.

## 9.2 BRIEFING

Prior to the first aircraft movement of each shift, the ACHO shall brief the Flight Deck LCPO, Hangar Deck Officer, and other key aircraft handling personnel on the day's anticipated movements. This briefing shall include expected wind and deck conditions, and any other information pertinent to safety. Additional aircraft moves shall be briefed at the appropriate level. See Figure I-1 for example of briefing sheet.

## 9.3 AIRCRAFT HANDLING OFFICER (ACHO)

The Aircraft Handling Officer shall perform the following:

1. Plan and coordinate aircraft moves to ensure accomplishment of flight operations as scheduled in the air plan, and to facilitate aircraft maintenance requirements.
2. Work closely with the ACE maintenance representative and assign aircraft side number to each event specified on the air plan. If there is a change of aircraft side number, notify PriFly.
3. Brief all key flight and hangar deck personnel on the following:
   a. Start and launching sequence.
   b. Disposition of downed and spare aircraft.
   c. Aircraft to be towed or taxied.
   d. Recovery spot (when a recovery is scheduled to follow a launch).
   e. Flight deck safety.
   f. Any special evolutions or requirements.
4. Incorporate a Liquid FOD Instruction with the embarked ACE.

## 9.4 FLIGHT DECK LCPO

The Flight Deck LCPO shall inspect the flight deck prior to each evolution to ensure the following:

1. Propellers, tailpipes, and helicopter rotors have sufficient clearance.

2. Each aircraft can be safely taxied from its spot.
3. Deck edge antennas are properly positioned and the jackstaff, flagstaff, and bow/stern rails have been removed and stowed.
4. All aircraft and aircraft handling support equipment, when not in use, shall be properly positioned and secured in accordance with NAVAIR 17-1-537 utilizing proper configuration of chocks and tiedowns as set forth by the ACHO.
5. No FOD on the flight deck/catwalks, all weather decks, all padeyes, and scuppers are thoroughly cleaned.
6. Hydraulic/oil/fuels spills are thoroughly scrubbed, cleaned, and vacuumed.

## 9.5 CRASH AND SALVAGE OFFICER

The Crash and Salvage Officer is responsible to the ACHO for supervising Crash and Salvage personnel and fire parties in handling aircraft emergencies during flight and general quarters, and for ensuring the readiness of assigned personnel, firefighting, and salvage equipment on both the flight and hangar decks. They are also responsible for the overall training of air department and ACE in aircraft firefighting and crash and salvage operations.

## 9.6 HANGAR DECK OFFICER AND HANGAR DECK CHIEF

The Hangar Deck Officer and Hangar Deck Chief shall inspect the hangar bay on a daily basis to ensure the following:

1. No FOD on the hangar bay/aircraft elevator wells, and all padeyes are thoroughly cleaned and vacuumed.
2. Hydraulic/oil/fuels spills are thoroughly scrubbed, cleaned, and vacuumed.
3. All aircraft and aircraft handling support equipment, when not in use, shall be properly positioned and secured in accordance with NAVAIR 17-1-537 utilizing proper configuration of chocks and tiedowns as set forth by the ACHO.

## 9.7 AVIATION FUELS MAINTENANCE OFFICER

The Aviation Fuels Maintenance Officer is responsible for the overall operation and maintenance of the aviation fuel system and its associated equipment, fueling and defueling of embarked aircraft, and the automotive gas stowage system. The Aviation Fuels Maintenance Officer or designated representative shall inform the Air Officer and ACHO on the current status of all aviation fuel equipment.

## 9.8 MAINTENANCE LIAISON OFFICER

The Maintenance Liaison Officer shall ensure that the ACHO is kept continuously apprised of aircraft status and maintenance requirements and shall maintain liaison between the air department and the squadron’s line and maintenance personnel. For this purpose, aircraft status and maintenance request boards shall be maintained in flight deck control. A squadron Maintenance Liaison Officer or representative should be on duty at all times during flight quarters or general quarters. Normal station is flight deck control; however, the Maintenance Liaison Officer shall be free to move about the flight deck and hangar deck as necessary to perform required duties. Changes in aircraft status shall be submitted to the squadron Maintenance Liaison Officer and entered on the aircraft status board. Entries and changes to the maintenance request board shall be handled in the same manner. To assist the Maintenance Liaison Officer in the performance of duties, the squadron/detachment maintenance department shall provide an aircraft status report, including up aircraft, down aircraft, estimated time in maintenance, special maintenance requirements, and information of interest to the ACHO via the Maintenance Liaison Officer. Updates shall be given to the ACHO:

1. Prior to scheduled flight quarters.
2. As early as possible during general quarters and unscheduled flight quarters.
3. As changes occur.
4. To reflect status of recovered aircraft.

The Maintenance Liaison Officer is responsible for the overall performance of crewchiefs, plane captains, and troubleshooters, and shall ensure that no aircraft is placed on jacks or is otherwise immobilized without permission from the ACHO. The Maintenance Liaison Officer shall also obtain permission for APP, APU, IPP, engine, and rotor maintenance turnups. Maintenance functions involving electronic emission shall be limited by existing EMCON conditions.

## 9.9 FLIGHT DECK SAFETY

**General.** The entire flight deck is an extremely dangerous area during flight operations. High wind, high noise level, hazards of fire, proprotors, rotors, and jet blasts make it imperative that all personnel take all possible precautions to enhance safety.

**Restricted Area.** The flight deck is a restricted area during flight operations and at other times when deemed necessary by the ACHO. Personnel shall not be on the flight deck, in catwalks or on ladders leading to the flight deck unless directly involved in flight deck operations. When not at flight quarters all personnel are to check in with Flight Deck Control before entering the flight deck. All personnel assigned a flight deck billet shall be qualified in accordance with NAVEDTRA 43426-0 series. Port troop walkway will be secured to all non-essential personnel during special evolutions.

### 9.9.1 General Precautions

1. Pilots and crews returning from flights shall remain in full flight gear with visors down and clear the flight deck immediately. Flight crews shall not congregate on the deck to watch further operations.
2. All personnel shall exercise the utmost diligence in keeping clear of proprotors, jet intakes, exhausts, helicopter rotor blades, and tail rotors.
3. The hazards associated with flight deck operations can be intensified by lack of rest. Supervisors shall continually monitor personnel for signs of fatigue during all phases of flight deck operations.
4. All flight deck personnel shall wear complete flight deck uniforms during flight operations. A complete flight deck uniform shall consist of TYCOM approved flight deck trousers, flight deck jersey, flotation device, steel-toe boots, leather gloves, helmet with goggles and jersey corresponding in color to that of their respective detail and with their billet title on the jersey and flotation vest.
5. Between the hours of sunset to sunrise, a MK1 life vest shall be worn on the flight deck and catwalks at all times.
6. Plane Handlers shall use extreme caution in reaching their stations when engines are turning. They shall approach aircraft from the sides, and while alongside the wheels, shall crouch on the deck in such a manner as to maintain secure footing against sudden blasts.
7. All personnel shall keep loose gear to a minimum on the flight deck and hangar deck.
8. Flight deck personnel shall not carry rags, papers, magazines, key chains, or other loose gear in their pockets or about their person while on the flight deck.
9. No smoking or chewing tobacco shall be permitted at any time on the flight deck, hangar deck, or catwalks.
10. Extra caution shall be exercised when training new and inexperienced personnel to work on the flight deck. Newly assigned, inexperienced flight deck personnel shall observe a minimum of three days and three nights of flight deck operations from vulture's row prior to participating in any on-deck watch station. A person experienced in flight deck operations and safety shall be personally assigned to each new arrival to escort and monitor them while on vulture's row. A minimum of three days and three nights of flight deck operations escorted shall be completed prior to working the flight deck unescorted.
11. All personnel working on top of aircraft and vertically extended GSE gear shall wear cranials or flight helmet with chinstraps secure. Maintenance on, or preflight of, any portion of an aircraft that extends beyond the ship's deck edge is prohibited.

12. All personnel who work on the flight and hangar decks shall be annually screened for flight deck physicals by the medical department. The Medical Officer shall implement an effective system for monitoring and reporting the physical qualification status of flight/hangar deck and Air Wing personnel. Any personnel failing eye acuity tests shall not be assigned to work at a critical flight deck billet or hangar deck billet.

### 9.9.2 Aircraft Handling and Support Equipment Security

Aircraft handling/crash and salvage mobile equipment shall be parked with a minimum of two tiedowns (one forward/one aft), rear wheel chocked, and parking brake set unless specific tiedown requirements are stated in the Support Equipment's technical data. Crash cranes shall be parked and secured with a minimum of 13 tiedowns.

All rolling stock (e.g., air-conditioners, nitrogen carts, weapon carts) shall have parking brake set and a minimum of two tiedowns tending fore/aft unless specific tiedown requirements are stated in the Support Equipment's technical data. When not at flight quarters, mobile equipment shall be "packed" fore-and-aft with the vehicles at each end secured with two tiedowns. All vehicles shall have one rear wheel chocked and parking brake set.

F-135 Engine Shipping System/Maintenance Transportation Trailer (ESS/MTT) with F-135 Engine installed, shall set parking brakes (4) and minimum four (4) tiedowns in fore/aft configuration. For heavy weather, high sea state requires a minimum of eight (8) tiedowns in fore/aft configuration.

### 9.9.3 Equipment

The Flight Deck LCPO shall ensure that all tractors, spotting dollies, towbars, chocks, and other equipment used in the handling of aircraft on the flight deck are in satisfactory condition and are properly utilized. The Hangar Deck Officer has a similar responsibility with regard to the equipment used on the hangar deck. All aviation support equipment operators shall be licensed in accordance with current directives. Tractor drivers, shall under no circumstances, operate a tractor with defective brakes or steering. Discrepancies shall be reported immediately to a competent authority. Defective towbars, chocks, wheels, and tiedowns shall be taken out of service and turned in for repair. Towbars, chocks, and tiedowns not in use shall be stowed in designated spaces. Additionally, ready hot suit men and ready fire unit operators shall not be utilized as tow tractor operators during aircraft start, launch, recovery, and respot evolutions.

Specific requirements for crash and salvage crews and equipment operator requirements can be found in the U.S. Navy Aircraft Firefighting and Rescue Manual (NAVAIR 00-80R-14), and the NATOPS U.S. Navy Aircraft Crash and Salvage Operations Manual (Afloat) (NAVAIR 00-80R-19).

## 9.10 MOVEMENT OF AIRCRAFT

The minimum deck crew for movement of aircraft on the flight deck or hangar deck consists of tractor driver, brake rider (not required on H-1 helicopters), two safety observers, a qualified aircraft director, two plane handlers, and, in the case of H-1 helicopters, one handler on the tailskid. The cockpit of the aircraft shall be manned by a pilot, plane captain, or qualified brake rider (does not apply to H-1 helicopters). Duties and safety rules for movement of aircraft on flight decks and hangar decks are provided in the following paragraphs.

When heavy weather conditions are forecast, as many aircraft as possible shall be moved to the hangar deck and all aircraft secured.

Flotation gear with auto-inflator assemblies installed are not authorized in aircraft during moves or any other time when the aircraft is not secured to the deck.

Movement of aircraft when ship's pitch exceeds 2 degrees and ship's roll exceeds 5 degrees is not authorized without the ship's Commanding Officer's permission, as conditions may result in aircraft momentum exceeding the tow tractor's control authority resulting in loss of aircraft control or personal injury, even on a dry deck.

WARNING

- Heavy weather conditions may cause unexpected movement of unsecured aircraft on the flight deck.
- Flotation gear with auto-inflator assemblies in unsecured aircraft may trap personnel inside if the aircraft goes overboard during heavy weather and/or aircraft moves.

### 9.10.1 Aircraft Director Duties

In preparing to move an aircraft (taxi, tow, by hand) the director shall ensure that:

1. The cockpit is manned by a qualified brake rider.

**Note**

Movement of no-brake aircraft shall be approved by the ACHO. When an aircraft with inoperative brakes must be respotted, the cockpit shall be unmanned, plane handlers in position to chock the main wheels instantly if ordered, and additional safeties posted on the outboard sides with tiedown chain attached to the aircraft outboard tiedown point with hook point in hand to secure aircraft instantly as directed.

2. All unnecessary personnel are removed from the aircraft.
3. Only qualified personnel shall pump up the ground handling wheels for skid aircraft.
4. The towbar is securely attached to the aircraft and to the tractor, or, if the aircraft is to be moved by hand, that the towbar is properly tended by another director or specifically designated towbar person.
   a. Towing of AV-8B aircraft with engine running is prohibited.
   b. Towing of helicopters/tiltrotors with rotors engaged is prohibited.
   c. On AV-8B aircraft, the nosewheel steering accumulator shall be depressurized before attaching the towbar. The nosewheel is then free to caster ±179°.
   d. Manual pushback should not be attempted if the ship's pitch exceeds 2° or roll exceeds 5°.
   e. F-35B backing up under its own power is prohibited.
   f. F-35B movement via personnel physically pushing on aircraft surfaces is prohibited.
   g. AV-8B aircraft can be chocked without danger to personnel with the engine at idle and nozzles aft.

CAUTION

- When using A/C spotting dolly (A/S32A-32), on H-53 aircraft with the FLIR installed, the FLIR support boom must be placed in the stow position to prevent damage to the FLIR ball.
- When using A/C spotting dolly (A/S32A-32) on H-53 aircraft, failure to ensure adequate clearance between the spotting dolly and the aircraft may result in damage to the aircraft.
- When using A/C spotting dolly (A/S32A-32) on AV-8B aircraft, failure to ensure adequate clearance between the spotting dolly and the centerline pylon can cause serious damage to stores, including the Defensive Electronic Countermeasures (DECM) and LITENING pod. Refer to Figure 9-1.

**Note**

Movement of aircraft by manual pushback is inherently less safe than towing by a vehicle. Pushing should only be used as a last resort or because of operational necessity. As rolling and pitching of the ship increases, so does the danger of manual pushback.

5. All chocks, tiedowns, power cables, and other servicing/securing devices are removed prior to moving the aircraft.

**WARNING**

- Failure to install all ordnance safety pins in racks, launchers, and dispensers prior to movement may result in inadvertent release of ordnance/stores.
- Removing tiedowns and chocks prior to attachment of the towbar to the tractor may result in injury.
- When moving aircraft by hand, removing chocks and tiedowns before all positions are manned, brakes are checked firm, and deck pitch has been determined safe may result in aircraft damage or injury to personnel.
- In H-53 helicopters, without the APP, both the tow tractor brakes and available H-53 braking may be insufficient to prevent the helicopter from rolling because of ship's motion.

**Note**

The V-22 uses either the APU or an auxiliary brake pump to power the aircraft brake system. The auxiliary brake pump is the preferred method as it allows for better communication between the brake rider and the tow crew, but either system may be used.

6. If weapons loading/downloading is in progress, receive assurance from the ordnance safety supervisor that the aircraft is safe to move insofar as weapons are concerned.
7. Adequate clearance exists to permit safe movement of aircraft.
8. Safety men are posted as required to ensure clearance if in proximity to other aircraft, bulkheads, or obstructions.
9. The qualified brake rider signifies the aircraft brakes have been checked, that adequate braking pressure is available, and the brakes appear to be in working order. On AV-8B aircraft, the brake accumulator shall be pressurized to a minimum of 2,000 psi using the hand pump before pushing or towing the aircraft.
10. All personnel except those necessary for the move are well clear of the aircraft.

**WARNING**

Working or passing beneath a moving aircraft is extremely hazardous.

### 9.10.2 Brake Rider Duties

For wheelbrake equipped aircraft, the qualified brake rider shall:

1. Ensure that ejection seat safety pins are installed, and safety pins are in place in the landing gear/auxiliary tanks as appropriate. For AV-8B aircraft, ensure that safety downlocks are in place on the outrigger landing gear.

2. Ensure the seat and rudder pedals are adjusted as required to ensure the ability to fully apply the brakes and see the director at the same time.

3. Ensure the windshield and side panels are clear of grease, cleaning compound, or any other film that might limit visibility.

4. Conditions permitting, open cockpit canopy, windows, or overhead hatches.

CAUTION

Deck winds over 40 knots require that cockpit canopies be closed, thus preventing audible signals from passing between the brake rider and the director.

5. Test the brake.

CAUTION

- Aircraft brakes should be tested twice, before chock removal and just after the aircraft begins to roll.
- Aircraft parking brakes shall only be released on signal from the director.

6. Advise the director of any unusual condition or aircraft discrepancy that might make movement hazardous.

7. Utilize available safety equipment such as safety belts, shoulder harness, life preservers, and so forth.

### 9.10.3 Safety Precautions During Movement of Aircraft

Before having chocks and tiedowns removed, the director shall call for “Brakes” and receive visual or verbal confirmation from the brake rider that the brakes are being held. The aircraft's tailwheel/nosewheel shall be unlocked only on signal from the director. While aircraft are being moved:

1. Movement shall be slow enough to permit a safe stop to be made within the clear space available, and in no case faster than the chock handlers can walk.

2. The director shall ensure that he/she or another director is at all times plainly visible to the brake rider in the cockpit.

3. Safety observers shall be stationed as necessary to ensure safety clearance anytime an aircraft will pass in proximity to another aircraft, bulkhead, or other obstruction. Only directors or personnel specifically designated by the Flight Deck LCPO or Hangar Deck Officer shall act as safety observers. The safety observer and the director in control of the aircraft shall either have each other in sight at all times or have a second safety observer stationed in a position to relay signals.

WARNING

When moving aircraft utilizing an A/S32A-32 spotting dolly, the range of motion is great enough for the dolly to impact the aircraft being towed, causing bodily injury or death.

4. Prior to attaching a towbar to the nosewheel of a V-22 with the APU running, the brake rider and director shall ensure the power steering and nose lock are deactivated.

**WARNING**

Activation of the power steering and moving pedals or activation of the nose lock feature will cause an attached towbar to swing. This may result in injury to personnel.

5. The movement of aircraft shall not be attempted if sea state or the maneuvering of the ship produces excessive motion. Should a maneuver that would result in excessive deck motion be necessary while an aircraft is being moved, an announcement of the impending turn shall be made over the 3 MC or 5 MC system in time to permit the application of chocks and tiedowns before the turn will commence.

6. When an aircraft is being taxied or towed anywhere on the flight deck in proximity (within 5 feet) to any obstruction, Wing Safeties and Tail Safety shall be used. Failure to follow procedure may cause damage to equipment.

7. During periods of high winds or when the deck is unsteady, chock handlers shall closely tend each main wheel. The brake rider shall apply partial brakes as necessary to prevent excess speed from building up. When these conditions prevail, aircraft shall not be moved by hand except in case of operational necessity.

8. Aircraft shall be moved by aircraft handling equipment unless deck space available does not allow safe maneuvering of the equipment and towed aircraft. When moving aircraft by hand, the aircraft should be moved against the movement of the deck. This requires that the aircraft always be pushed rather than allowing it to roll with the movement of the ship.

**WARNING**

Pushers positioning themselves in front of aircraft wheels, risk injury or death.

9. Tractor drivers shall not move an aircraft except under the control of a director. If a director’s signal is not completely understood, the driver should stop and await further instructions.

10. Sudden stops by tractors towing aircraft shall be avoided except in an emergency.

11. Directors, safety observers, and chock/tiedown handlers shall be equipped with whistles that they shall hold in their mouths while controlling aircraft movement.

12. When an aircraft with inoperative brakes must be respotted, the cockpit shall not be manned and chock handlers shall remain in position to chock the main wheels instantly if ordered. In addition, deck crew member shall be immediately available with tiedowns ready.

13. As an aircraft nears its parking spot, it shall be slowed to a speed that will permit an immediate stop. Directors and safety observers are responsible for maintaining safe clearance for the tractor when maneuvering in close quarters, since the tractor driver must watch the director and is often unable to check the clearance for himself or herself.

14. Prior to backing aircraft to deck-edge spots, chock handlers shall be positioned so as to enable them to chock the main wheels instantly.

15. When an aircraft towbar has to be repositioned to permit a better path of movement prior to aircraft reaching interim or final spot, the aircraft should be chocked and initial tiedowns installed prior to disconnecting the towbar.

16. When moving skid-configured aircraft, a qualified plane captain or maintenance personnel shall closely monitor ground-handling wheel actuator handle.

**WARNING**

On a pitching and rolling deck, the nose of skid equipped helicopters may pitch up and cause the tail stinger to contact the deck. H-1 aircraft are particularly susceptible to this problem. Handlers positioned on the tailskid should not try to counter this motion as injury may occur.

**Note**

- Utilization of counterweight on the AH-1 aircraft ammo bay doors shall be done only after a proper risk assessment is completed by the aircraft handlers and supervisors to ensure that conditions are safe for use of counterweight on the ammo bay doors.
- Utilization of personnel as counterweights on the AH-1 ammo bay door has potential for risk of injury. A thorough brief of the hazards and controls shall be conducted for all personnel involved prior to the towing evolution.
- If personnel are utilized as counterweights on AH-1 ammo-bay doors, ensure that their feet are positioned to preclude entanglement under skid. Personnel seating and disembarking shall not occur until the aircraft has come to a complete stop.
- Prior to utilization of personnel as counterweights, ammo bay doors shall be visually inspected for damage and/or other defects that may compromise structural integrity. Inspection shall examine hinge, cable and all cable attach points, attachment fasteners as well as the ammo bay doors. Defects and/or damage shall be repaired prior to use by personnel.

17. When the signal for brakes is given, the brake rider shall immediately apply full brakes. Care must be exercised to apply brakes simultaneously, particularly when the aircraft is being moved by hand. The brake signal is a sharp blast on the whistle accompanied by the standard visual signal.
18. The main wheels shall be chocked as soon as the aircraft stops, and the director shall remain with the aircraft until the handling crew has completed the initial four-point tiedown. The tractor shall then be unhitched and brake rider notified by the director that he or she may leave the cockpit. Where practicable, the towbar should remain attached to the aircraft. The crewchief/plane captain shall there upon inspect attached tiedowns for required number and proper installation.
19. In parking aircraft on the hangar deck, allow clearance for access to and operation of fog foam monitors and fire plugs, as well as for the operation of hangar bay doors. Do not park aircraft, yellow gear, or any item in a way that would prevent complete opening of engineering escape scuttles on hangar deck.
20. Personnel shall not ride on tractors except in the driver’s seat.
21. Chock handlers are not safety observers and safety observers are not chock handlers.
22. The V-22 is equipped with a nose landing gear hiking feature. Once activated, the nose gear hike provides adequate clearance between the aircraft and SD-2 spotting dolly to allow the spotting dolly to engage/disengage the aircraft at any angle up to and including ±90° off aircraft centerline.

**CAUTION**

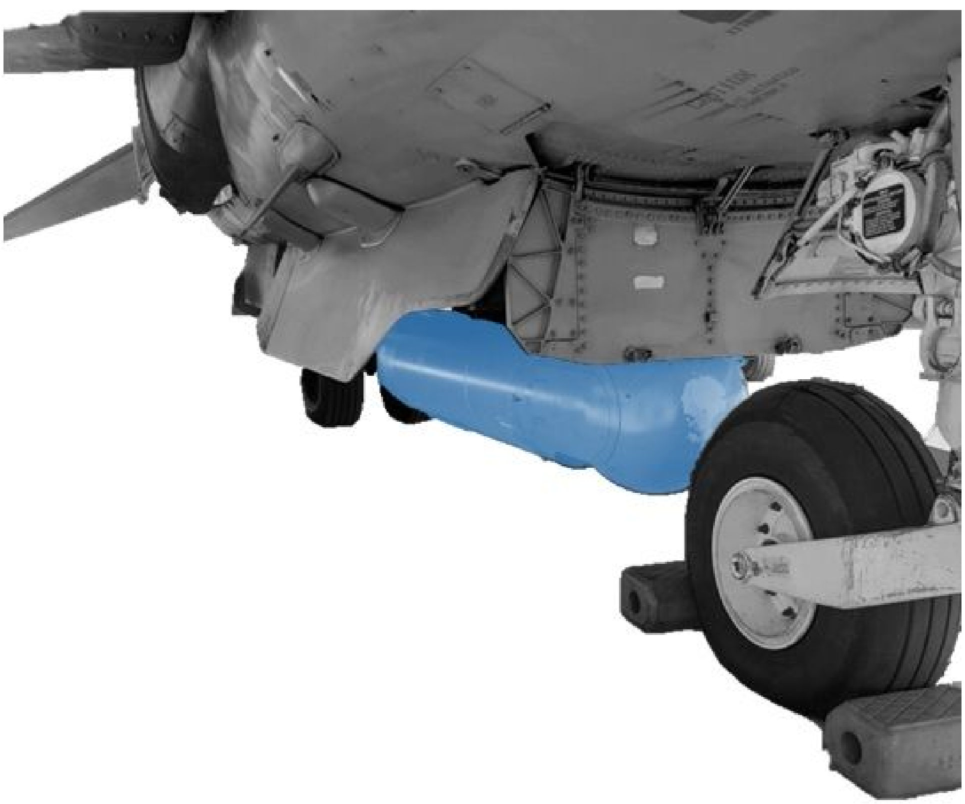
- When the word is passed to standby for a turn, failure to exercise caution while moving aircraft may result in damage.
- Engaging or disengaging the V-22 with the SD-2 spotting dolly, even with the V-22 nose hiked, at angles of 60° and higher during moderate and heavy weather conditions may result in nose landing gear door damage due to contact with the spotting dolly. To eliminate the potential for damage during moderate and heavy weather conditions, manually straighten the nose gear using a tow bar prior to spotting dolly engagement.

23. Prior to moving AV-8B aircraft with an aircraft spotting dolly (A/S32A-32), all stores shall be downloaded from the centerline (station 4) pylon.

**CAUTION**

When using A/C spotting dolly (A/S32A-32) on AV-8B aircraft, failure to ensure adequate clearance between the spotting dolly and the centerline pylon can cause serious damage to stores, including the Defensive Electronic Countermeasures (DECM) and LITENING pod. Refer to Figure 9-1.

Figure 9-1. AV-8B DECM/Litening Pod



24. On LHA-6 type ships, when positioning V-22 aircraft underneath either forward or aft high bay for blade spreading evolutions, all landing gear wheels shall be positioned within the V-22 wheel box boundaries.

CAUTION

Failure to accurately position V-22 landing gear within V-22 wheel boxes as described above will result in rotor blades contacting ship structure during blade spreading evolution.

### 9.10.4 Limitations Associated with the V-22 Fixed In-Flight Refueling Probe

#### 9.10.4.1 General

V-22 aircraft outfitted with the fixed In-Flight Refueling (IFR) probe has an increased length which affects shipboard spotting procedures.

#### 9.10.4.2 Towbar Requirements

V-22 aircraft outfitted with the fixed IFR probe require that a 20/24 foot ALBAR be used for spotting evolutions on the flight deck.

CAUTION

Use of the standard 15 foot ALBAR with the fixed IFR probe will result in damage to V-22 aircraft during ground handling maneuvers.

### 9.10.5 Elevator Operation

Elevator operation shall be coordinated with the maneuvering of the ship. Aircraft elevators shall be operated by qualified personnel only. A director shall supervise the elevator anytime it is being raised or lowered and shall make sure to be plainly visible to the elevator operator at all times. Elevators shall not be operated without two-way communications, either verbal or visual, between operators.

Directors should position the aircraft on the elevator so that it can be towed directly off without repositioning.

Tiedowns and chocks shall be set prior to elevator movement. Before signaling for the elevator to be raised or lowered, the director shall check the safety stanchions for proper clearance, then signal for the stanchions to be raised. The elevator operator shall then sound the warning horn; check to ensure that all personnel, aircraft, and equipment are clear; and raise the safety stanchions. As soon as the stanchions are up, the director shall signal for the elevator to be raised or lowered. Only with Air Officer approval shall an elevator be lowered when the safety stanchions are inoperative; under these circumstances, directors shall be stationed near the elevator to warn approaching personnel. If the safety stanchions on the hangar deck should fail, a temporary lifeline shall be rigged as quickly as possible. After the safety stanchions have been raised or the warning given, no person shall attempt to board or leave the elevator.

Elevators shall remain at hangar deck level for as short a time as possible. An elevator carrying an aircraft to the hangar deck shall not be lowered until it has been ascertained that a crew is standing by to remove the aircraft from the elevator as soon as it arrives at hangar deck level. Ensure that all personnel riding the elevator wear flight deck life preservers and stand on the inboard half of the elevator.

**WARNING**

- Extreme caution shall be exercised when operating deck edge aircraft elevators during periods of high winds and/or heavy seas.
- Riders shall not be permitted on the elevators at night except in cases of emergency and authorized by the commanding officer.

**CAUTION**

During F-35B operations in the aft slash, heat and exhaust impingement can cause damage to aircraft and ground support equipment spotted on the starboard elevator during engine start and ground operations.

#### 9.10.5.1 V-22 LHD/LHA-6 Type Elevator Transit Procedures

1. Flight Deck to Hangar Deck.

**CAUTION**

Nose gear hike must occur before the SD-2 spotting dolly can engage the aircraft at the hangar deck level. Nose gear hike can occur prior to or after the aircraft is spotted on the LHD/LHA-6 Type elevator.

After ensuring sufficient slack in the tiedown chains exists, activate the nose gear hike. The nose strut will extend on average 8 inches during nose gear hike. Use the tow tractor and tow bar to back the aircraft onto the LHD/LHA-6 Type elevator. Spot the aircraft perpendicular to the ship's centerline. After securing the aircraft, lower the elevator to the hangar bay level. Attach the SD-2 spotting dolly to the aircraft, remove chocks and chains, raise the nose gear of the aircraft using the SD-2 spotting dolly, and pull the aircraft into the hangar bay for unrestricted hangar bay spotting.

2. Hangar Deck to Flight Deck.

**CAUTION**

Nose gear hike must occur before the SD-2 spotting dolly can engage the aircraft at the hangar deck level.

After ensuring sufficient slack in the tiedown chains exists, activate the nose gear hike. The nose strut will extend on average 8 inches during nose gear hike. Use the SD-2 spotting dolly to back the aircraft onto the LHD/LHA-6 Type elevator. Spot the aircraft perpendicular to the ship's centerline. After securing the aircraft, raise the elevator to the flight deck level. Remove chocks and chains and use the tow tractor and tow bar to remove the aircraft from the elevator. Relieve the nose gear hike nitrogen charge to allow the aircraft to return to its normal state. This may be done anytime after the SD-2 spotting dolly has spotted and disengaged the aircraft on the elevator.

### 9.10.6 Parking

1. Aircraft often are parked in proximity to the deck edge, other aircraft, or a part of the ship's structure; both directors and pilots shall exercise extreme care in giving and answering signals. Although the pilot is responsible for the control of the aircraft, it is the director's responsibility to ensure that an intended parking spot is clear and offers sufficient space. In many cases, the pilot is forced to rely entirely upon the judgment of the director in maneuvering an aircraft in close quarters. When parking aircraft, an access route shall

be maintained to allow MFFV the ability to respond to any emergency. When deck multiple, operational tasking, alert posture, etc., preclude establishing an access route to the scene of an emergency, a 1 1/2-inch AFFF hose shall be manned and positioned upwind of any aircraft refueling or conducting of a maintenance turn.

2. A director controlling aircraft movement into final spot shall ensure they are strategically located to view the area of least clearance to other aircraft or structures. In addition, when the moving aircraft has other aircraft or structures in proximity (5 feet or less) on the opposing side or tail, a safety or safety(s) shall be positioned in order to relay safe clearance to the controlling director. When an aircraft is being taxied or towed anywhere on the flight deck in proximity (within 5 feet) to any obstruction, Wing Safeties and Tail Safety shall be used.

### 9.10.7 F-35B Hot Towing Procedures

A qualified Aircraft Director shall be present for any aircraft movement. The controlling director assumes responsibility for material condition of the aircraft, support equipment, and safety of the move crew. The director shall brief the move in accordance with established procedures to address the conduct of the move, surroundings, and any hazards or obstructions. A qualified move crew shall consist of:

Director.

Tractor Driver.

Pilot.

Two Plane Handlers (Chock walkers).

Two Wing Safeties (As required).

Tail Safety (As required).

1. Director will taxi aircraft to desired spot and stop aircraft.
2. If weapons loaded on aircraft, verify with the ordnance crew leader the aircraft is safe to move.
3. Director will give the pilot the adjustable length towbar (ALBAR) and tractor hand signals. The director shall receive acknowledgement from the pilot that it is okay to connect the ALBAR and tractor to the aircraft.
4. Director will give the hand signal for the pilot to disengage the nosewheel steering IAW NAVAIR 00-80T-113 and confirm with the pilot the nosewheel steering has been disengaged by a thumbs up from the pilot. Personnel shall not attach ALBAR until nosewheel steering has been disengaged and confirmed with the pilot.
5. Unnecessary personnel shall remain clear of the ALBAR swing arc while ALBAR is being attached.

**WARNING**

Failure to confirm disengagement of nosewheel steering may result in injury or damage to flight deck personnel and equipment. Serious or fatal injury can occur during aircraft towing evolution.

6. Director will instruct the plane handlers to attach the ALBAR to the aircraft and continue to give the pilot the “hold brake” signal. Personnel shall not straddle the ALBAR at any time during this process.
7. Director will clear all personnel from the immediate vicinity of the ALBAR swinging path, then ensure the nosewheel is properly disengaged by moving the ALBAR back and forth 1 to 3 feet to verify disengagement of steering. If not disengaged remove tow bar and repeat prior steps.
8. Director will direct plane handlers to attach ALBAR to tractor and then communicate to the pilot by hand signals that ALBAR and tractor is attached. The director shall receive thumbs up from the pilot acknowledging their signals in reference to the tractor and ALBAR is attached to the aircraft.

9. Director will signal to the pilot to release brakes. The director shall maintain line of sight with the pilot at all times. The director will proceed with the hot tractor towing evolution.
10. When an aircraft is being taxied or towed anywhere on the flight deck in proximity (within 5 feet) to any obstruction, Wing Safeties and Tail Safety shall be used. Failure to follow procedure may cause damage to equipment.
11. Once the director stops the aircraft at desired spot, the director shall give the hold brakes signal to the pilot. The director shall secure the aircraft to the deck at final spot. The main wheels shall be chocked once signal is given from the controlling director, and the director shall remain with the aircraft until the handling crew has completed the initial tiedowns.
12. The director shall ensure personnel are clear from the immediate vicinity of the ALBAR swinging path and then direct the plane handlers to disconnect the tow tractor first and then the ALBAR.

### 9.10.8 Report of Damage to Aircraft

Any damage to an aircraft, no matter how slight, shall be immediately reported to the ACHO, Flight Deck LCPO, or Hangar Deck Officer who shall immediately report the incident to the Air Officer and inform the squadron maintenance liaison representative. The aircraft shall not be flown until it has been inspected and declared to be in an “up” status by authorized squadron personnel.

The Flight Deck LCPO and Hangar Deck Officer shall maintain a record showing director's name, model aircraft, BUNO weather conditions, and a brief summary of circumstances for occurrences in which aircraft are damaged, regardless of the extent of damage. Reports of these occurrences shall be made in accordance with OPNAVINST 3750.6 series and a report shall generated as per Appendix E. A copy of the report shall be forwarded to TYCOM COMNAVSURFPAC/COMNAVSURFLANT Code (N42).

### 9.10.9 General

Any damage to an embarked naval aircraft, no matter how slight, shall be immediately reported to the ACHO and other cognizant persons in the chain of command. The circumstances surrounding the incident shall be thoroughly investigated and required reports submitted. The aircraft shall not be flown until it has been inspected and declared to be in an up status by authorized squadron personnel. Records of each aircraft handling mishap shall be kept by the ACHO for 1 year and copies distributed to responsible divisions.

### 9.10.10 Definitions

To standardize and clarify Aircraft Handling Mishap (AHM) reporting, the following definitions shall apply. These definitions amplify OPNAVINST 3750.6, and in no way alter the intent or meaning of that instruction.

#### 9.10.10.1 Aircraft Handling Mishap

This is an incident in which damage to an aircraft occurs while the aircraft is embarked on or is being hoisted on/off an amphibious assault ship. The damage should be associated with normal aircraft handling practices such as towing, taxiing, aviation fueling evolutions, or aircraft/weapons/crash and salvage support equipment operations. Incidents caused by non-air department personnel, involving non-air department equipment, or otherwise not directly attributable to an air department causal factor shall also be categorized as a crunch and reported per existing directives. An aircraft handling mishap is a special category of mishap in addition to those delineated in OPNAVINST 3750.6.

#### 9.10.10.2 Reportable/Non-Reportable

The current version of OPNAVINST 3750.6 shall be used in establishing damage criteria, which in turn determines whether a crunch is reportable as a mishap. All damage, however slight, shall be reported, investigated, and recorded. Formal reports are required only when damage dollar cost/man-hours for repair/injury are equal to or greater than the specified criteria. Incidents of lesser severity shall be informally reported on the command’s crunch report form and retained for training and reference purposes. A copy of this report shall be forwarded to the TYCOM COMNAVSURFLANT/COMNAVSURFPAC (N42).

#### 9.10.10.3 Reports/Records

Reports are normally originated by the aircraft reporting custodian. Reports of aircraft handling mishaps (AHM) shall be sequentially numbered by calendar year in the same manner as naval aircraft mishaps, e.g., USS Essex AHM 19-01. This number shall be included in the remarks section of the originator's (normally aircraft reporting custodian) mishap report.

### 9.10.11 Crunch Report Format

The content of a ship's crunch report shall be per Appendix J. A copy of the report shall be forwarded to TYCOM COMNAVSURFLANT/COMNAVSURFPAC (N42).

### 9.10.12 Aircraft Security

Aircraft shall be tied down as directed by the ACHO or their representative. Unless otherwise specified, chain tiedowns shall be used exclusively. Tiedowns shall run from a proper tiedown fitting on the aircraft to a padeye on the deck without pressing against oleo struts, hydraulic lines, tires, or any other portion of the aircraft.

When an aircraft is spotted adjacent to an elevator, tiedowns shall not be attached to the elevator or across the safety stanchions.

Tiedowns shall be removed only when signaled by an aircraft director. They shall be affixed to aircraft to preclude movement in any direction. This requires that they tend to oppose each other. They should be as equally distributed on the aircraft as possible.

H-53 aircraft shall be positioned into the wind and secured with blade struts or clamps whenever winds are forecasted to be over 45 knots, if deck density allows.

**CAUTION**

> Due to the large cross-section of the CH-53E, damage to the main rotor and tail rotor blades may occur from blade-to-blade or blade-to-fuselage contact when parked in the forward or aft slash position with winds over the deck in excess of 45 knots.

#### 9.10.12.1 Tiedown Categories

Tiedown requirements are divided into four categories as defined by the following.

#### 9.10.12.2 Initial Tiedown

This condition of aircraft security exists immediately prior to aircraft movement from spot and immediately after aircraft is parked. With the ACHO's approval, aircraft scheduled for "launch" on any given cyclic events, with the exception of "spare" aircraft, shall be on initial tiedowns. Initial tiedowns installation after recovery or re-spot is the responsibility of the plane handling crew. As a minimum, initial tiedowns are required for all refueling operations.

#### 9.10.12.3 Intermediate Tiedown

This condition of aircraft security shall exist during flight quarters. Aircraft that are not scheduled for launch on any given cyclic events shall be on intermediate tiedowns. Intermediate tiedown installation is the responsibility of the plane captain.

#### 9.10.12.4 Permanent Tiedown

This condition of aircraft security is required when not at flight quarters or when the aircraft is not expected to fly or be re-spotted. Aircraft parked on the hangar bay shall be on permanent tiedowns.

### 9.10.12.5 Heavy Weather Tiedowns

This condition of aircraft security is required upon the determination of the Aircraft Handling Officer.

**Note**

The ACHO may adjust the number of tiedowns required in each of the above categories when such action is indicated because of aircraft model, and shall order an increase in the number of tiedowns required when such action is indicated because of expected wind, sea state, or ship’s maneuvers.

### 9.10.12.6 AV-8B Tiedown

Presently configured AV-8B aircraft have four tiedown points, two on each outrigger (one inboard and one outboard). To secure the nosegear, the nosewheel must be positioned on the aircraft centerline. The standard TD-1A tiedown is inverted, the chains crossed to form an “X,” and the deck end of the tiedown attached to the aircraft (and vice versa). Tiedowns attached to AV-8B outriggers can be removed after engine start and attached before engine shutdown without danger to personnel.

**Note**

Permanent tiedown requires 10 tiedown chains for the AV-8B.

Figure 9-2. F-35B Tiedown Pattern

**CAUTION**

- On tiedowns to the NLG strut, chains installed past 90 degrees of the strut may damage Nose Landing Gear Door.
- Tiedown chains installed in the path of Weapons Bay Door travel path will damage the doors when they are cycled.

**Note**

When installing tiedowns to the AFT main landing gear (MLG) tiedown rings it is best invert the tiedown chains with turnbuckles at the padeyes.

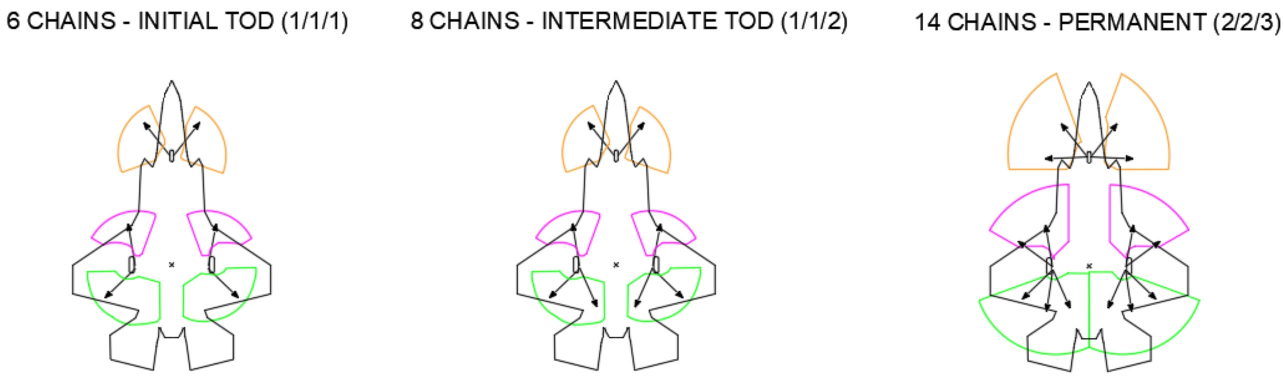
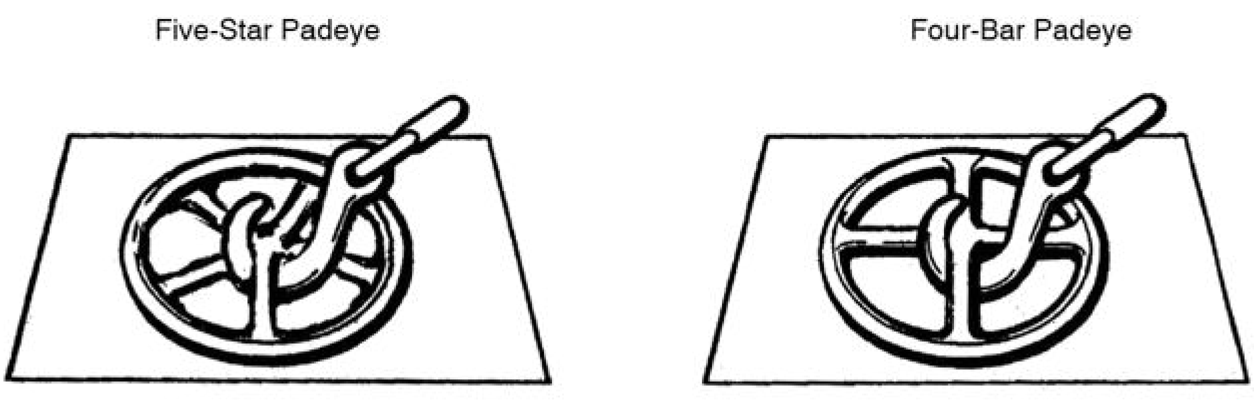



Figure 9-3. Padeye



### 9.10.12.7 Tiedown Requirements

The following tiedown conditions are provided as a minimum guide for safe handling operations of shipboard aircraft and may be increased as conditions necessitate.

| | SECURITY CONDITIONS | | | |
|---|---|---|---|---|
| AIRCRAFT TYPE | INITIAL | INTERMEDIATE | PERMANENT | HEAVY WEATHER |
| AH-1 | 4 | 4 | 8 | 16 |
| AV-8 | 6 | 8 | 14 | 18 |
| F-35B | 6 | 8 | 14 | 24[1] |
| H-1 | 4 | 4 | 8 | 12 |
| H-3, H-53 | 4 | 6 | 12 | 20 |
| MH-60R/MH-60S | 4 | 6 | 12 | 18 |
| V-22 | 6[2] | 12 | 18 | 22[3] |

Notes:

1. For F-35B, maximum tiedown weight for heavy weather is 40,000 lbs. Park aircraft perpendicular or parking parallel to ship centerline. All other parking orientations prohibited in Heavy Weather.
2. Initial tiedown of V-22 to FWD and AFT aircraft tie-down points (2 port, 2 starboard).
3. For V-22, Heavy Weather authorized for parking parallel to ship centerline only. All other parking orientations prohibited in heavy weather.

**Note**

- For all T/M/S a minimum of nine chains shall be used during elevator operations.
- Refer to the NAVAIR 17-1-537, WP 00400 and applicable T/M/S MIMS for correct number and application of tiedowns.

**CAUTION**

Excess chain hanging down from landing gear tiedown rings can damage components on the landing gear.

### 9.10.12.8 Aircraft Jacking Tiedown Security

The following procedures are required for shipboard aircraft jacking:

1. When underway, the ACHO shall coordinate jacking of aircraft with the OOD.
2. The ACHO or their representative shall approve jacking aircraft for maintenance.
3. Squadron personnel shall refer to the Maintenance Instruction Manual for procedures during jacking operations.

### 9.10.12.9 Heavy Weather Aircraft Spotting

When a heavy weather spot requirement has been determined by the ship's commanding officer, the ACHO shall ensure the following:

1. A maximum number of aircraft shall be spotted on the hangar deck in such a manner to permit access to fire stations at all times.
2. Remaining aircraft on the flight deck shall be spotted fore-and-aft as far from deck edge and the fantail as possible.
3. Chocks should be secured to wheels with approved manila line to prevent them from working free.

4. Maximum tiedowns shall be applied and parking brakes shall be set.
5. Deflating of struts and/or tires shall be accomplished as required.
6. Fuel load adjustments shall be made as required.
7. Aircraft integrity watches shall not venture onto the flight deck without permission from the ACHO or ACHO representative. Aircraft integrity watches shall function as two-person teams (buddy system).

## 9.11 FUELING AND DEFUELING AIRCRAFT

The Air Officer is responsible for supervising and directing the receipt, stowage, and dispensing of aviation fuel as well as the enforcement of safety precautions and the maintenance and security of the aviation fuels systems. An Aviation Fuels Security Watch shall be conducted in accordance with Chapter 4 of NAVAIR 00-80T-109, Aircraft Refueling NATOPS Manual.

The aviation fuel officer is responsible to the Air Officer for efficient and safe operation of the aviation fuel system and for the management of the aviation fuel quality control program. He or she is further responsible for ensuring strict compliance with all applicable technical directives concerning the inspection, maintenance, and operation of the aviation fuel system. For maintaining quality and limiting contamination of aircraft fuel, NAVAIR 00-80T-109 applies.

### 9.11.1 Fueling and Defueling Procedures

Aircraft should normally be fueled as soon as possible after recovery. Each crewchief/plane captain shall notify the aviation fuel petty officer or aviation fuel control talker in flight deck control if it becomes apparent that the fueling crew has missed the aircraft. The crewchief/plane captain shall also request that the aircraft be topped off as necessary after a maintenance turnup.

**Note**

The F-35B has a maximum weight for Heavy Weather tiedowns. If Heavy Weather conditions are expected, considerations for delaying refueling should be given to avoid having to defuel the aircraft for Heavy Weather mooring.

Aircraft shall be fueled in accordance with the direction from the squadron Maintenance Liaison Officer. In the event the squadron desires a fuel load other than that specified in the air plan, a request shall be made to air operations that the air plan be changed to show the fuel load desired. Requests for the defueling of aircraft for maintenance purposes shall be made to the aircraft handler via the Maintenance Liaison Officer.

Fueling shall be conducted in a manner that will cause a minimum interference with aircraft respot. Prior to the recovery, fueling crews shall be standing in or near their stations to break out hoses and start fueling aircraft. Aircraft and fuel hoses shall be properly grounded before fueling and all ground wires removed after fueling is completed. The aviation fuel officer shall ensure that the appropriate smoking lamp condition is set before fueling or defueling.

The crewchief/plane captain shall ensure correct fuel load and security of the filler caps. The fuel control talker maintains the fuel status board in flight deck control. This board shall list each aircraft on board and show its exact fuel load.

### 9.11.2 Special Safety Precautions During Fueling/Defueling

1. Aviation fuel shall not be handled in open containers.
2. Waste or rags soaked in aviation fuel shall be properly disposed of as soon as possible and shall not be left about the deck.
3. No lights, except safety lights, shall be introduced into any compartment or space where aviation fuel or flammable fumes are present.
4. Aviation fuel shall not be discharged overboard without the permission of the ship’s commanding officer.

5. If aviation fuel is spilled on the deck, it shall immediately be swabbed and the incident reported to the ACHO.
6. Lighted cigarettes or exposed flames of any kind shall not be permitted in the vicinity of tanks, pipes, or containers carrying aviation fuel.
7. Fuel shall not be issued for any purpose other than fueling.
8. Personnel shall avoid breathing aviation fuel vapors over long periods.
9. If skin or clothing has come in contact with aviation fuel, personnel shall wash with soap and water as soon as possible.
10. Personnel handling fuel shall wear protective goggles to prevent eye injury.
11. All the measures prescribed for quality control of the fuel being transferred shall be complied with prior to fuel delivery.
12. The smoking lamp shall be out on the flight deck, hangar deck, and all weather decks because of the continuous presence of aviation fuel.
13. Fire protection shall be provided in accordance with NATOPS U.S. Navy Aircraft Firefighting and Rescue Manual, NAVAIR 00-80R-14.
14. All personnel are to exercise extreme caution and be on the alert for dangerous situations that may occur.
15. Refueling shall be secured when any fuel spillage is noted and not continued until the spillage has stopped and the residue is cleaned up.
16. Only those members of the flightcrew and ship's refueling crew considered necessary for the conduct of the fueling operation should be in the vicinity of the aircraft.
17. A ground wire shall be attached to the deck and then to the aircraft before the fueling nozzle is attached to the aircraft.
18. Aviation fuel portable transfer pumps, defueling equipment and hoses containing fuel may be stored on the hangar deck in a location and manner where they are protected by the AFFF sprinkler system. Portable fuel systems containing fuel shall meet all flashpoint requirements as an aircraft prior to locating on the hangar deck. All portable fuel systems that have not been fully drained of fuel shall be tagged as "FULL" and its contents clearly indicated.
19. Refueling evolutions are prohibited during lightning strikes within 5 nm.
20. Qualified refueling supervisor shall be in the vicinity during all refueling/defueling evolutions.

**WARNING**

When hot refueling a V-22 on spot 5, nacelle exhaust is directly outboard of Aircraft Fueling Station No. 4. An off spot landing or slight wind change can direct exhaust into the fueling station which may result in damage to aircraft fueling equipment and injury to personnel.

**Note**

- When launching or recovering aircraft on spots adjacent to refueling operations care should be taken to avoid overflight of personnel working in the catwalks, as advised by PriFly.
- When refueling aircraft on spot 4, landings on spot 2 should be avoided due to over flight of fueling personnel in the catwalks.
- When refueling aircraft on spot 2, takeoffs from spot 4 should be avoided due to over flight of fueling personnel in the catwalks.
- When refueling aircraft on spot 9, landings on spot 7 should be avoided due to over flight of fueling personnel in the catwalks.
- When refueling aircraft on spot 7, takeoffs from spot 9 should be avoided due to over flight of fueling personnel in the catwalks.

### 9.11.3 Hot Refueling Procedures

Aircraft equipped for pressure refueling may be hot refueled during training, operational, and combat situations. During hot refueling the LSE/Director shall:

1. Position oneself where one can see the pilots, fueling station operator, and nozzlemen.
2. Ensure that all refueling personnel, equipment, chocks, and tiedowns are clear before giving the taxi/launch signal to the pilot.
3. The AV-8B aircraft may be hot refueled with the canopy open at the pilot's discretion.

Hot refueling on aircraft that require gravity refueling is not authorized.

### 9.11.4 Hot Refueling Safety Precautions (Helicopter)

The procedures for hot refueling shall be in accordance with the NAVSHIPS technical manual and applicable aircraft NATOPS flight manuals. The aircraft shall be chocked and the initial tiedown applied. Tiedown crew shall remain clear of helicopter rotor arc in the vicinity of the aircraft during hot refueling operations. They shall remain immediately available for rapid breakdown should an emergency launch be required.

All personnel movements from one side of the aircraft to the other shall be via the nose. Under no circumstances should personnel work in proximity to a tail rotor. Hot refueling of engaged tail rotor helicopters on spot 1 is not recommended.

Any passengers on board the aircraft shall be debarked prior to commencement of hot refueling.

### 9.11.5 Pressure Refueling with Aircraft Shutdown

Pressure refueling with aircraft shutdown is the normal procedure. The aircraft shall be completely shut down and only the plane captain, refueling party, and fire party need to remain on station. Additional information on pressure refueling can be found in the applicable aircraft NATOPS flight manual. Oxygen servicing, other than converter replacement at the aircraft, and fueling shall be conducted as separate evolutions.

## 9.12 MEDICAL CASUALTY ON THE FLIGHT DECK (HELICOPTER)

Medical casualties brought aboard by aircraft shall be removed from the aircraft and handled in accordance with the ship's casualty handing bill. The ship's medical department shall be notified as far in advance as possible to allow medical personnel to meet incoming aircraft.

# CHAPTER 10

# Weapons Handling Procedures

## 10.1 WEAPONS HANDLING PROCEDURES

Airborne weapons handling evolutions introduce a degree of risk that requires careful planning and preparation. The necessity to train for and to conduct combat operations requires the acceptance of certain risks that cannot be avoided in the handling of explosive weapons. Commanding Officers shall continually weigh the requirements to perform each weapons' evolution against the additional risk that is being interjected, and accept only those evolutions in which the need clearly outweighs the risk. The Ordnance Handling Officer, designated Air Gunner, and Marine Expeditionary Unit aviation ordnance officer when Marine Forces are embarked, shall ensure adequate ordnance supervision is maintained during all flight deck ordnance handling evolutions.

**Note**

- During all ordnance handling evolutions, compliance with the Aqueous Film Forming Foam (AFFF) system and mobile fire-fighting equipment information in NAVAIR 00-80R-14 is mandatory.
- Prior to the execution of any drill, consideration should be given to ensure that the drill will not compromise ordnance handling safety.

### 10.1.1 Weapon Definitions

1. Airborne stores — Tanks (fuel and spray), pods (refueling, photo, ECM, and so forth), nonexpendable training weapons, targets, and all similar items intended for carriage internally or externally by aircraft, including the racks, launchers, adapters, and detachable pylons used for such carriage. This definition applies to items that are not normally separated from the aircraft in flight.
2. Airborne weapons — All missiles, rockets, bombs, mines, torpedoes, pyrotechnics, ammunition, guns and gun pods, and all similar items intended for carriage internally or externally by aircraft. This definition applies to items that are normally separated from the aircraft in flight.
3. Arming — An operation whereby a weapon is changed from a safe condition to a state of readiness for initiation.
4. Arming area — That area where forward firing ordnance is changed from a safe condition to a state of readiness. All arming evolutions required to be accomplished in the arming area by the aircraft store loading manual/checklist shall be performed in this area.
5. Dearming area — That area where forward firing ordnance is changed from a state of readiness to a safe condition. All dearming evolutions required to be conducted in the dearming area by the individual store loading manual/checklist will be conducted in this area.
6. Downloading — An operation that removes airborne weapons/stores from an aircraft.
7. Loading (rearming) — An operation that installs airborne weapons/stores on or in an aircraft.
8. Rearming area — That area where an operation is conducted that replenishes prescribed airborne weapons in/on an aircraft or where final dearming is accomplished following recovery and engine shutdown or following ground abort. Only loading, downloading, arming, and dearming authorized to be conducted in the rearming area by the individual store loading manual may be conducted in this area. All weapons handled or loaded in the rearm area shall be safe and remain safe.
9. Safing (dearming) — An operation whereby a weapon is changed from the state of readiness for initiation to a safe condition.

An EOD representative shall be immediately available on the flight deck during all launch and recovery operations involving fused ordnance.

The EOD representative, the Air Gunner, and the designated ACE ordnance representative shall be equipped with an SRC-22 (or equivalent) communications set during launch and recovery operations.

Figure 10-1. Weapon Malfunction Indication / Reporting Chart

| WEAPON FAMILY GROUP | HUNG WEAPON | HANGFIRE | MISFIRE | NTENT TO LAUNCH (ITL)I |
|---|---|---|---|---|
| **Bombs** | Those weapons which cannot be fired or dropped because of weapon, rack, or circuit malfunction. | | Ordnance term for a failure of the primer or the propelling charge of a weapon after an attempt to fire same. | |
| **Missiles** | | The term HANGFIRE is defined as an undesired delay in the ignition of a motor after the firing key has been closed. It is important to remember that there is no way to distinguish a misfire from a hangfire until sufficient time has elapsed after the last attempt to fire. | The term MISFIRE includes all situations in which a motor fails to ignite after the complete sequence of events prescribed for launching the motor have been performed. | The term Intent to Launch includes all situations in which weapons, such as AMRAAM, HARPOON, SLAM-ER, JSOW, ETC. for which the launch signal has been initiated and whose launch has subsequently been aborted by the aircrew or failed prior to separation of the weapon from the aircraft. Specific ITL procedures shall be followed in each appropriate Manual, when an ITL situation arises. |
| **Rockets** | | A deliberate actuation, release, or launch where motor ignites but fails to leave the launcher. Examples include failure to override detent, inbore/ in-launcher explosions, or a delayed function. | Misfire is any forward firing weapon that an attempt to fire was performed and the weapon's motor did not function. Example is, the intervalometer rotated indicating launcher received voltage or any time aircrew reports the release button was actuated and the weapon was not expended. | |

### 10.1.2 Hazards of Electromagnetic Radiation to Ordnance/Radiation Hazards Safety Precautions

Modern radio and radar transmitting equipment produce high intensity RF fields. Such fields can cause premature actuation of sensitive Electro–Explosive Devices (EEDs) contained in ordnance systems and biological injury to personnel working in the vicinity of these radiating elements. Sparks or arcs caused by high-intensity fields are a potential source of ignition for fuel-air mixtures. The most susceptible periods are during assembly, disassembly, loading, unloading, or testing in electromagnetic fields. The effect of premature operation of these devices will vary with the function of the device initiated. The most likely effects are dudding, loss of reliability, or, in the case of rockets and flares, ignition of the propellant or illuminant. In several electromagnetic radiation environments, there is a low but finite probability of warhead detonation. It is necessary, therefore, to control the ship's electromagnetic environment positively during the presence of HERO susceptible ordnance.

Prior to embarkation, pilots, aircrews, and ACE ordnance personnel shall familiarize themselves with the latest HERO conditions in NAVSEA OP 3565/NAVAIR 16-1-529 and with the ship's HERO/EMCON bill. The "Radio Frequency Hazards to Ordnance, Personnel and Fuel Technical Manual," prescribes detailed operating procedures and precautions for inclusion in the ship's EMCON bill.

Prior to commencing operations involving HERO susceptible ordnance, the ship shall ensure the proper HERO condition is set. A visual display (blue HERO beacon or Lima flag [yellow/black checked]) indicating the HERO condition in effect shall be prominently displayed so that assembly, flight deck, and hangar deck ordnance personnel can readily ascertain the HERO condition status at all times. The OOD shall make appropriate announcements over the ship's general announcing system for the setting and cancellation of HERO EMCON conditions.

A HERO survey required by NAVSEA OP 3565/NAVAIR 16-1-529 shall be requested by the ship. Upon completion of the survey, the ship shall establish a HERO/EMCON bill.

### 10.1.3 Weapons Movement/Handling

The presence of airborne weapons outside of designated magazines greatly increases the danger to the ship should a fire or explosion occur. The greater the quantities of weapons involved, the greater the risk. To minimize this risk, only that quantity of weapons required to sustain operations shall be transferred to the hangar or flight deck. Breakout, assembly, and staging of live ordnance shall be performed only by certified ordnance handlers, so designated in writing by the commanding officer.

With exception to actual loading evolutions, weapons on skids/trucks shall be positioned fore and aft and continuously attended.

Airborne weapons shall be positioned in such areas as to be readily available to afford adequate time for safe aircraft loading. Staging areas for assembled or unassembled weapons shall be restricted to areas that:

1. Are directly supported by jettison ramps on the flight deck or within 50 feet of jettison location on the hangar deck/sponson areas or supported by an operable weapons elevator below the hangar deck.
2. Have at least two clear routes for emergency movement that are maintained clear of obstructions.
3. Are covered by a water/deluge system, operable sprinkler system, or protected by dedicated manned firehoses.
4. Are located at least 10 feet from aircraft fueling stations and 20 feet from LOX facilities, converters, and carts.
5. Are continually manned by qualified and certified personnel for rapid jettison.

The following locations are authorized for staging areas:

1. Flight deck, hangar deck, and sponson that meet requirements of 1 through 5 above.
2. Handling/assembly areas outside magazines may be supported by operable elevators in lieu of jettison facilities.

Maximum weapon density in staging areas shall be limited to that quantity:

1. Flight deck — required for the next two events; includes a total of weapons loaded, in process of loading, or staged.
2. Hangar deck and sponsons — one event.

3. Handling areas — required for immediate strike up/down.
4. Assembly area — to sustain operations.
5. LUU-2B/B parachute flares and Marine location markers shall be stowed in jettisonable topside lockers or pyrotechnic ready service lockers when outside the confines of the magazine except for temporary staging.

Staging areas shall be used for ready service only, not for protracted stowage nor for extending the total weapon stowage capacity of the ship. All weapons in the staging area(s) shall be on MHE or AWSE.

All ordnance jettison ramps shall be fully functional and exercised daily prior to flight operations in accordance with applicable PMS. Jettison ramps in the staging areas shall be rigged and unobstructed at all times when ordnance is present. All other ramps shall be rigged when required as determined by the Air Gunner. The aircraft elevators shall be used to supplement weapons elevators and expedite strike up of weapons during heavy ordnance operations. Coordination and thorough preplanning between the Air Gunner and ACHO is essential to meet load plan requirements and assure safety.

During all aviation ordnance evolutions, a certified ordnance safety supervisor shall be assigned from the ship to ensure compliance with safety standards. These safety supervisors shall be thoroughly familiar with this manual and other applicable directives. Safety supervisors have the authority and responsibility to immediately halt any evolution if, in their judgment, safety is being jeopardized. An evolution so halted shall not be continued until the matter is properly resolved.

Properly equipped EOD and a ship's weapons representative shall be stationed accessibly to provide technical assistance to the ACHO in weapons and disposal. The weapons flight deck safety petty officer and designated ACE ordnance representative shall maintain a status board that confirms the type, quantity, and location of all weapons on the flight deck and/or aircraft. Additionally, weapons cook-off data shall be conspicuously posted in plain view of the ACHO.

### 10.1.4 Weapons Assembly/Disassembly

Because of the inherent dangers involved, the assembly and disassembly of aviation ordnance shall be closely controlled. All weapons unpacking, assembly, disassembly, loading, and unloading shall be done in accordance with NAVSEA OP 4, NAVSEA OP 3565/NAVAIR 16-1-529 and the appropriate checklists, SRCs, and technical manuals. Ordnance shall be assembled, disassembled, and loaded into launchers/magazines only by personnel properly certified. In accordance with OPNAVINST 8020.14 series, there shall be a safety supervisor present whenever ordnance is being assembled, loaded, unloaded, or disassembled. All assembly and disassembly shall normally be conducted in the ordnance assembly area.

The assembly area shall be maintained HERO safe whenever the ordnance is HERO susceptible. If HERO susceptible ordnance is moved outside the normal HERO safe assembly area, or if assembly must be done in a HERO unsafe area, the operations officer shall ensure that the appropriate HERO condition has first been set.

Ships shall maintain NAVAIR technical manuals for each type aviation weapon onboard.

All weapons systems maintenance shall be accomplished by ACE ordnance personnel.

All personnel involved with unpacking, assembly, and disassembly shall be appropriately certified.

### 10.1.5 Weapons Loading/Downloading

Appendix F provides a list of weapons with associated restrictions that are approved for loading, strikedown, downloading, and/or recovery aboard LHA and LHD type ships.

Compliance with weapons requirements contained in the load-plan demands close coordination between the ACHO, ship's group, squadron ordnance personnel, and the squadron Maintenance Liaison Officer. The MEU Ordnance Officer is responsible for advising the squadron maintenance liaison officer, as early as possible, of any special requirements or considerations that apply to loading of selected aircraft. The squadron Maintenance Liaison Officer shall ensure the ACHO is apprised of any peculiarities in special requirements, configuration, or status that may make certain aircraft unassignable for particular types of weapons loads.

After close coordination with squadron maintenance representatives, the ACHO shall designate deck spots as early as possible to afford adequate time for loading, required configurations, and the performance of aircraft release and control system checks.

Simultaneous fueling, loading, and downloading of weapons, preloaded ITERs, and DITERs on the same aircraft is not authorized.

Loading/downloading and oxygen servicing, other than converter replacement at the aircraft, shall be conducted as separate evolutions.

Loading of forward firing ordnance requiring simultaneous and/or prior electrical connections for loading is not authorized while fueling of that aircraft is in progress.

No other electrical connections to weapons or removal/installation of impulse cartridges shall be accomplished while fueling of that aircraft is in progress. Fuel hoses shall not be positioned under weapons being loaded/downloaded.

Aircraft to be loaded with rockets and/or missiles should be positioned so that accidental discharge will not endanger personnel, the ship, or other aircraft.

Lightning strikes within a 5 nm radius of the ship, all exposed ordnance evolutions shall cease until the condition clears the 5-mile radius. Ordnance handling shall be limited to the dearming of recovering aircraft during atmospheric disturbance.

When required, electrical power may be applied during the aircraft loading/downloading evolution, but should be held to a minimum consistent with operational requirements. Electrical power to the armament or weapon release and control circuitry shall not be applied while weapons are being loaded/downloaded.

**Note**

Aircraft hot loading is authorized in accordance with NAVAIR conventional weapons loading manuals, checklists, and/or Joint Technical Directives (JTD) for the specific aircraft and weapons. The ship's commanding officer has final approval authority.

Helicopter "stray voltage" checks shall be made after normal rotor engagement when the electrical system is on aircraft power. The signal to commence "stray voltage" checks shall not be given until the copilot's hands are in view of the flight deck ordnance safety supervisor and acknowledgment by the pilot is received. Any deviations from the above procedure shall be in accordance with the authorized weapons checklist concerned.

**Note**

The flight deck is always the preferred area to load/download aircraft.

Loading limited amounts of weapons on the hangar deck may be authorized by the ship's commanding officer when the operational necessity dictates the acceptance of the additional risk of fire with fuel and explosives in a confined area. Authorization for loading on the hangar deck shall be limited to those aircraft schedules for the next launch or on an alert condition, and is restricted to the particular weapons indicated in Appendix F.

**Note**

Inert conventional weapons and captive air-launched missiles shall be loaded/downloaded and armed/dearmed in the same manner as live weapons.

### 10.1.6 F-35 Weapons Concept of Operation

1. All weapons loading/downloading evolutions conducted on the F-35B shall be accomplished in accordance with NAVAIR and Joint Technical Data (JTD) procedures. In the event the JTD and service operational requirements differ, service requirements shall take precedence.
2. F-35B pneumatic bomb racks and pneumatic missile launchers are charged during loading/downloading evolutions and may be in the hangar and/or stored charged.

**Note**

Because the F-35 has multiple and redundant built in safety systems, it is considered safe once on deck and may be taxied prior to launch or landing to expedite clearing of spots.

3. The Ordnance Ground Safing Switch, Counter Measure Safing Switch, and Weapons Bay Door Safing Switch may be manipulated in the rearming area after engine start up and before engine shut down.

4. The AIM-9 SAFE/ARM selector handle may be rotated to ARM (if applicable) in the rearming area in accordance with JTD. Arming signals shall be in accordance with the Aircraft Signals NATOPS Manual (NAVAIR 00-80T-113).

5. The AIM-9 SAFE/ARM selector handle may be rotated to SAFE and the nose cone installed in the rearming area.

**Note**

HERO is not required to be set prior to gun troubleshooting, as the 25MM gun ammunition is HERO safe.

6. F-35B with unsafe-forward firing ordnance shall be recovered and then canted outboard. There the aircraft shall be chocked and chained until ordnance personnel can determine the posture/condition of the unsafe ordnance.

7. No live ordnance shall be loaded in the F-35 weapons bay on the hangar deck.

### 10.1.7 Arming

Weapons arming shall be conducted in a designated arming area. When forward firing weapons are involved and the NAVAIR weapons/stores loading checklists/SRCs so require, the area ahead of the aircraft shall be clear and maintained clear until completion of the launch. Arming shall be conducted only while the aircraft is at a complete stop and control of that aircraft has been turned over to an arming crew supervisor. All arming signals shall be in accordance with NAVAIR 00-80T-113. Arming of helicopters shall be conducted after pilot has signified ready for takeoff and after tiedown chains/chocks are removed.

Arming of fixed-wing aircraft with forward firing ordnance shall be conducted after the launch officer's initial walkaround inspection and prior to commencing launch procedures.

Exit paths for each type of aircraft shall be formalized by the Air Gunner, Ordnance Officer, or Air Officer to provide the least hazard to arming crewmembers.

**WARNING**

- To avoid exposure to aircraft intake, exhaust, rotors, and exhaust end of missile/rocket motors, arming crews should use extreme caution when exiting an armed aircraft.

- Personnel shall not approach an aircraft to perform weapons system checks while the engine(s) is/are running until cleared to do so by the ordnance arming supervisor. The ordnance arming supervisor shall be positioned in full view of the pilot and shall have the pilot's attention.

- Fixed-wing aircraft shall not be taxied until pretaxi checks and required procedures prescribed in the appropriate NAVAIR weapons/stores loading checklist/SRCs and/or JTD have been completed.

### 10.1.8 Dearming

A designated aircraft dearming supervisor shall position himself or herself on the flight deck during recovery operations to ensure coordination between the LSE/aircraft director and the dearming crew, and shall indicate to the LSE/director those aircraft that require safing before being moved or shut down.

Fixed-wing aircraft landing with hung weapons (attempt made to fire) and/or forward firing weapons shall be safed as soon as practicable after landing. Helicopters shall be dearmed prior to installing tiedown chains. They shall be safed in accordance with NAVAIR weapons/stores loading checklists/SRCs and/or EOD emergency procedures. Aircraft safing signals shall be in accordance with NAVAIR 00-80T-113.

Aircraft landing with unexpended weapons shall have weapons safed in accordance with NAVAIR weapons/stores loading checklists/SRCs and in all cases prior to commencement of any postflight checks or refueling of the aircraft.

**WARNING**

Sweeping of personnel/equipment by armed aircraft must be minimal.

Appendix F lists weapons authorized for recovery.

### 10.1.9 Abort Strikedown

The flight deck is always the preferred area for downloading weapons. If it is required to strike below loaded aircraft, weapons shall be immediately downloaded from aircraft after reaching the hangar deck unless that aircraft is:

1. Readily available for flight and scheduled for the next launch.
2. In an alert condition.
3. Requiring only such maintenance or servicing as permitted on aircraft loaded with weapons.

In an abort/strikedown situation, the abort/after landing procedures for the particular weapons that are prescribed in the NAVAIR weapons/stores loading checklists/SRCs shall be accomplished before the aircraft is moved to the hangar deck. Bomb rack ejector/jettison cartridges shall be removed from all aircraft stations prior to or immediately after strikedown of the aircraft to the hangar deck.

**WARNING**

Failure to remove bomb rack ejector/jettison cartridges may result in the inadvertent release of ordnance/stores.

**Note**

- Certain weapons are specifically excluded from the provisions of this section. Refer to Appendix F for listing of those weapons that may not be struck below while loaded on an aircraft.
- Aircraft equipped with pneumatic weapons suspension and release equipment may be moved to the hangar fully pressurized provided the mechanical safing features are in a safe condition. Additionally, pneumatic suspension and release equipment may be stored fully pressurized when not installed on aircraft provided mechanical safing features on the equipment indicate a safe condition.

### 10.1.10 Maintenance on Loaded Aircraft

Maintenance shall not be conducted on aircraft loaded with weapons; however, routine servicing and minor maintenance that would ready the aircraft for the next launch may be conducted with the following restrictions:

1. Weapons shall be safed to the maximum degree as specified in the NAVAIR weapons/stores loading checklists/SRCs and JTD.
2. If a WARNING placard and/or control stick cover is displayed prominently in the cockpit, the maintenance or servicing of loaded aircraft that requires application of electrical power is limited to:
   a. Refueling.
   b. Replacement and checkout of communication and navigation equipment.
   c. Replacement and checkout of engine performance and flight instruments.
   d. Engine turnup/rotor engagement for checkout.
   e. Flight control and hydraulic system checks.
3. Maintenance requiring the application of electrical power to the armament or weapon release and control circuitry shall not be performed while weapons are loaded or are being loaded/downloaded.
4. An aircraft requiring extensive troubleshooting engine removal, complete jacking, and so forth, is not considered readily available for flight and shall be downloaded prior to commencement of the required maintenance.

Downloading includes removal of all impulse cartridges from ejector racks/breeches and all rounds of ammunition from feed chutes/feed mechanisms of internal guns.

# CHAPTER 11

# Miscellaneous Operations

## 11.1 PLANE GUARD AND SAR SUPPORT (HELICOPTER)

### 11.1.1 SAR Helicopter

(For readiness conditions refer to Chapter 5, Paragraph 5.1.7.) When at sea, the HSC detachment shall designate a SAR helicopter to be maintained, during daylight hours and when operationally feasible, in Condition IV for SAR/MEDEVAC contingencies. A SAR crew shall be designated and promulgated in the air plan. The designated crew shall remain the duty SAR crew until properly relieved by another crew; brief and preflight complete. The helicopter may be utilized for local administrative, logistic, or training functions while in standby status. The embarked squadron/detachment should assume SAR/MEDEVAC standby whenever the ship's HSC detachment helicopter is not operationally ready for SAR.

### 11.1.2 Safety Boat

Unless otherwise stated, a safety boat shall be ready during all flight operations and loaded with a crash kit containing the equipment delineated in NTTP 3-20.31, Surface Ship Survivability. The boat crew and handling detail shall be assigned and available to launch on order.

### 11.1.3 Plane Guard Ship

The plane guard ship shall maintain the rescue detail on deck during flight operations. The ship shall be positioned as requested by the OCE/CATF to rescue personnel either by boat or ship. The plane guard ship shall monitor the appropriate land/launch frequency during flight operations.

### 11.1.4 SAR Equipped Helicopter

As a minimum, a helicopter assigned a SAR mission shall be equipped as follows (Figure 11-1):

1. Operable hoist with rescue device.
2. Operable search light (for night search).
3. Sufficient liferafts to support passenger rescue requirements.

**Note**

Helicopters performing night over-water hover operations shall be equipped with operable stabilization and automatic hover equipment, or have sufficient external reference, either natural or artificial, to enable the pilot to establish and maintain a stabilized hover.

### 11.1.5 Minimum SAR Requirements

Figure 11-1 depicts the minimum SAR requirement for each mission. All options are listed in order of desirability. Any option listed above the minimum meets the requirement.

### 11.1.6 Control Authority

A helicopter, when designated primary SAR, shall be under the operational control of the Air Officer during launches and recoveries. During Case II and III operations or advisory control, the base recovery course and all course changes shall be provided by AATCC using a frequency readily available to primary flight control. Controlling agency shall conduct a radio check with the SAR helicopter at least every 20 minutes under night/IMC and shall track its fuel state. Concurrent operations may be conducted as in Paragraph 11.1.1 provided a responsive SAR capability is maintained during launch/recovery.

**Note**

The designated plane guard helicopter is "on station" when operating within 20 nm (day) or 10 nm (night) of the LHA/LHD. The helicopter shall remain within UHF range, monitor the assigned air control frequency at all times, and SAR capable helicopters will report "red light" in HHMM local (e.g. "6/7XX, 4 souls, 1645, red light").

#### 11.1.6.1 SAR Response

In the event of a plane guard incident the designated plane guard helicopter shall respond as directed by the Air Officer. The Air Officer will be responsible for controlling plane guard efforts when they are within sight of the ship. CIC/AATCC normally will control plane guard/SAR efforts when outside visual contact of the Air Officer. The SAR helicopter can proceed past red light in order to respond to the plane guard incident at the discretion of the aircraft commander.

### 11.1.7 SAR Swimmers (Helicopters)

SAR swimmers shall be equipped in accordance with CNAF M-3710.7.

When it becomes necessary for the embarked squadron/detachment to provide its own SAR, the SAR detachment shall furnish a qualified rescue swimmer provided the following conditions are met:

1. Approval of detachment OIC.
2. Assigned SAR aircraft has an operable external hoist.
3. Face-to-face brief between the pilots, crewchief, and assigned SAR swimmer conducted prior to takeoff.
4. Consideration given to the assignment of detachment SAR hoist qualified crew member to assist in rescue hoisting operations.

## 11.2 HELICOPTER EXTERNAL CARGO/VERTREP

### 11.2.1 General Description

External cargo evolutions addressed in this section include Marine external lift and Navy VERTREP. Because VERTREP is a Navy evolution involving replenishment of ships at sea, VERTREP requirements (i.e., aircrew currency, training, and mission requirement) have not been equally applied to Marine external cargo lift operations. The following general procedures shall apply to all service helicopters operating to/from amphibious aviation ships. Detailed information concerning VERTREP/external lift can be found in individual aircraft NATOPS manual. The SAR boat if being used with a SAR Helicopter in lieu of a Doppler equipped hover aircraft should be able to communicate with SAR aircraft via radio.

### 11.2.2 Briefing

Prior to commencing VERTREP/external lift operations, aircrews shall receive a thorough briefing. This brief shall include as a minimum:

1. Ship's operational procedures.
2. Helicopter director/LSE signals.
3. Traffic patterns.
4. Communication procedures.
5. Use of helicopter lights.
6. Special safety precautions.

7. Flight deck markings and obstruction clearances.
8. Aircraft and cargo spotting.
9. Emergency procedures.
10. Cargo to be carried.

### 11.2.3 Qualification

Aircrews shall have completed required external lift training requirements prior to commencing shipboard operations. Day shipboard external cargo indoctrination (i.e., briefing, pickup, and drops) should be accomplished prior to night operations. Aircrews shall be current in CQ prior to commencing external lift operations. Flight deck and combat cargo personnel shall be trained and qualified in accordance with fleet requirements.

Figure 11-1. Minimum SAR Requirements

| | SHIP AT ANCHOR | | SHIP UNDERWAY | |
|---|---|---|---|---|
| | Day | Night (1) | Day | Night (1) |
| Single Helicopter/Single Tiltrotor (6) | I; or G and H | I; or G and H | I; or G and H | I; or G and H |
| Multihelo/Multi-Tiltrotor or V/STOL (3, 4, 6) | D or F | B or F | D or G; or E and H | B; or E and G and H;<br>or E and I |
| Troop Lift (2, 5, 6) | C or F | A or F | C or G; or E and H | A; or E and I |
| All options listed above are in order of desirability. | | | | |

A. SAR equipped helicopter (automatic hover capability) airborne.

B. SAR equipped helicopter (automatic hover capability) in Condition I standby or airborne.

C. SAR equipped helicopter (nonautomatic hover capability) airborne.

D. SAR equipped helicopter (nonautomatic hover capability) Condition II standby or airborne.

E. Non-SAR equipped helicopter/tiltrotor equipped with liferafts airborne (may conduct other missions in the immediate area).

F. Safety boat waterborne.

G. Plane guard ship monitors Land Launch frequency and is in position (normally 2,000 yards abeam and 1,500 yards astern), per ATP-1(C).

H. Safety boat ready, crew assigned and available.

I. Safety boat manned and ready.

NOTES:

1. "A" must be used when sea state precludes rescue by safety boat or ship.
2. Troop lift is movement of combat-equipped troops over water.
3. During a large scale passenger movement consideration should be given to increasing the SAR readiness posture.
4. Multihelicopter/Multi-Tiltrotor evolutions are not "troop lift" evolutions.
5. Aircraft assigned primary SAR status shall not conduct troop transport unless relieved of SAR duties by a SAR capable aircraft.
6. H60 aircraft shall be spinning or crutched if H-53 or V-22 flight operations are being conducted on an adjacent spot.

### 11.2.4 Procedures

Aircrew procedures shall be in accordance with applicable aircraft NATOPS procedures and this publication.

Hookup crew procedures shall be in accordance with aircraft NATOPS, NWP 4-01.4, and this publication. Flight deck personnel procedures and load preparation shall be in accordance with NWP 4-01.4 and load placement on the flight deck shall be in the areas delineated in this chapter.

### 11.2.5 Wind

A relative wind of 330° to 030° and a steady velocity of 15 to 30 knots is considered optimum for pickup and delivery.

### 11.2.6 Control

All aircraft shall be under control of PriFly throughout pickup and delivery evolutions.

Two-way radio communications shall be maintained unless operating under EMCON conditions. Alternate signals shall be prebriefed for Electronic Emission Control (EMCON) operations.

Standard traffic patterns as addressed in Chapters 5 and 6 shall be utilized unless prior approval is authorized by PriFly.

**WARNING**

VERTREP patterns depicted in other manuals are not authorized without clearance from PriFly.

### 11.2.7 Vertical Replenishment/External Lift Operating Areas

**WARNING**

There are no VERTREP/external lift flight deck markings to provide adequate obstruction clearance. Therefore, all hands participating in a VERTREP/external lift operation must be particularly alert to ensure that adequate clearance is maintained between the aircraft and obstructions on and in the vicinity of the flight deck.

The fore and aft lineup lines of the helicopter landing spots on LHA and LHD flight decks represent optimum obstruction clearance and shall be utilized in the same manner as the tee line on air-capable ships. Therefore, the helicopter shall hover with its main and/or tall/aft rotor hub(s) over or outboard of these lines.

In order to provide sufficient obstruction clearance, VERTREP/external lift operations shall be restricted to the flight deck areas as discussed in the following paragraphs.

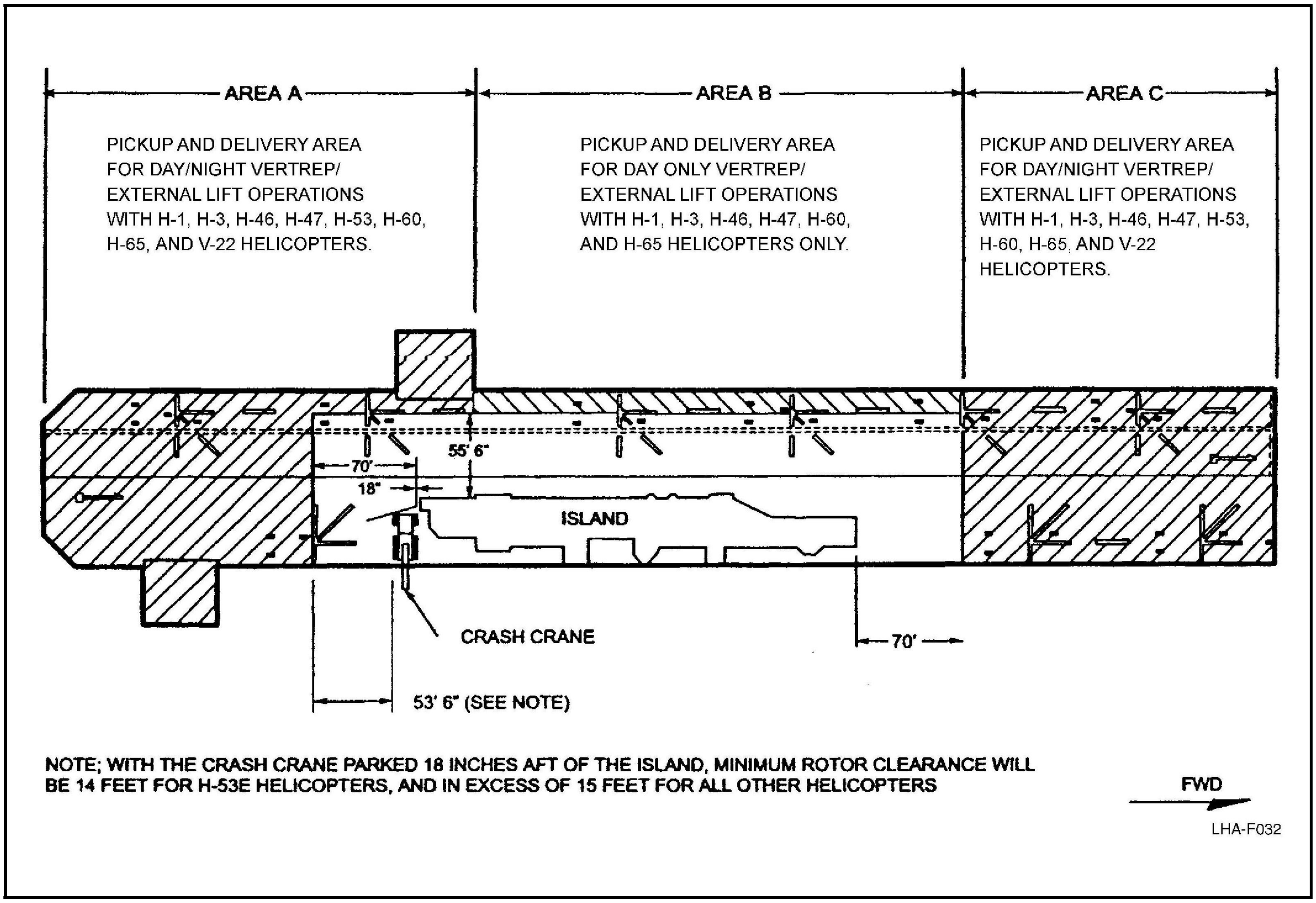
#### 11.2.7.1 LHD/LHA-6 Type

Day/night VERTREP/external lift operations shall be conducted in areas A, B, and C. See Figure 11-2 for aircraft authorized to operate in each area.

1. Night VERTREP/external lift operations shall only be conducted in areas A and C. See Figure 11-2 for aircraft authorized to operate in each area.
2. Area A — The area bounded by the port elevator, that portion of the deck from the elevator's leading edge along or outboard of the fore and aft lineup lines aft to the extended horizontal baseline of spot 8 and then across the flight deck.
3. Area B — The area from the horizontal baseline of spot 4 aft to the leading edge of the port elevator on that portion of the deck along or outboard of the fore and aft lineup lines.

4. Area C — The area of the flight deck forward of the extended horizontal baseline of spot 4.

Figure 11-2. LHD/LHA-6 Type Day/Night VERTREP/External Lift Operating Areas




## 11.2.8 Hookup

1. The hookup teams are the only personnel on the flight deck permitted under the helicopter while it is hovering to pick up cargo. Their responsibilities include ensuring the load is rigged correctly, static electricity is discharged, and the pendant is placed on the helicopter cargo hook or handed to the aircrew member. Sufficient room shall be available for the hookup team to move about and always have an escape route. Load height, when feasible, should be such that hookup can be accomplished without climbing on the load.

2. The hand-held static discharge device (grounding wand) should be used in order to prevent personnel injury. Supervisory personnel shall ensure that only trained groundcrew perform external load operations and that proper protective equipment (gloves, helmets, and boots) are worn at all times. In the case of the H-53, contact with the external hook shall be continuously maintained because the H-53 rotor system can recharge to its full static discharge potential within 1 second. Groundcrewmen shall not pass under the rotor arc until the helicopter is in a steady hover. When working under the helicopter a proper bracing stance is required to maintain footing.

3. The H-53 has inherent potential for generating severe electrical shock because of its greater power/load lift capacity. During flight/hover, buildup of shock potential is essentially instantaneous once grounding is removed. The static discharge device (grounding wand) and insulated gloves, with a minimum of 20,000 volts protection, shall be used when working with the H-53.

**WARNING**

- Failure of flight deck personnel to properly ground the H-53 during external or hover operations will result in a severe electrical shock which could lead to injury or death.
- Rotor downwash created by the H-53 and V-22 rotorcraft is greater than that produced by any other embarked helicopter. Significantly greater downwash directly off of the nose and tail of V-22 will be experienced when both rotors are over the flight deck. This downwash is sufficient to damage spread helicopter rotor blades and blow aircraft chocks, tiedown chains, and towbars about the deck or overboard, and cause personnel injury or death.

**CAUTION**

When launching/recovering, damage from downwash to aircraft stowed abeam the spot in use may occur even when folded, crutched, and properly secured.

**Note**

H-60 VERTREP operations do not require the use of the static discharge device.

## 11.3 NIGHT VISION DEVICE OPERATIONS

The use of NVDs affords pilots, aircrews, and flight deck crews improved night visual acuity. Operating with NVDs provides for increased safety, comfort levels and operational capabilities over unaided, night shipboard flight operations. However, inherent NVD limitations (field of view, depth perception, and environmental interference) require comprehensive training, awareness, and strict compliance with established procedures to ensure safe and effective NVD shipboard flight operations.

### 11.3.1 Authority for NVD Operations

These procedures are applicable for all shipboard aviation NVD operations involving USN, USMC, USA, USAF, DEA, U.S. Customs and foreign services. All ship/units/personnel involved in or anticipating involvement in shipboard aviation operations using NVDs shall be familiar with/ensure compliance with these procedures. Participating units will also ensure compliance with all parent service directives pertaining to NVD operations. In the event of conflict, this manual will take precedence.

### 11.3.2 Night Vision Devices Requirements and Limitations

Maintaining flight deck safety is the major concern when using NVDs for shipboard operations.

**WARNING**

Eye protection in conjunction with NVDs shall be worn.

NVD operations will be conducted under the following conditions:

1. NVD operations shall be conducted using Case I and Case II procedures. NVDs may be used in determining the presence of a visible horizon.
2. Minimum illumination for NVD training operations is 0.0022 lux as determined by the USN/USMC approved Light Level Planning Calendar computer program. Training operations at less than 0.0022 lux

may be conducted when aircrew shipboard NVD currency and proficiency requirements are met and with the approval of the operational commander. Forecast illumination levels may be degraded by cloud cover, humidity, dust, etc., that are not factored into the computer program output. Decisions to fly in conditions that are less than optimal must be tempered with sound judgment and decisions should be weighed on the side of caution. The ship operations department shall provide local illumination forecasts for each flight brief and as required for planning and operations.

3. The recommended distribution of NVDs during flight operations is listed below. Ships shall inspect NVD assets periodically and control assets as controlled equipage.

   a. Bridge: one set.

   b. Primary flight control: two sets.

   c. Flight deck supervisors/fly petty officers: one set each.

   d. Flight Deck LCPO: one set.

   e. Crash and salvage supervisor: one set.

   f. LSEs: one set per spot.

If compatible, NVD will be mounted on the LSE's cranial/helmet to allow free hand/arm movement and quick reconfiguration between aided/unaided operations.

### 11.3.3 NVD Training and Qualification

Shipboard personnel NVD flight operations training, qualification, and currency requirements are outlined in Appendix G.

### 11.3.4 Shipboard Lighting Requirements

#### 11.3.4.1 Ship's Navigation and Structural Lighting

Ship's lighting and light discipline are critical to NVD performance and safe conduct of NVD flight operations. Lighting configurations and intensities will vary with ambient conditions and aircrew/flight deck personnel proficiency and preference.

**CAUTION**

Operating ship's navigation lights on dim/off setting does not conform to nautical rules of the road. Close coordination will be necessary, both intraship and intership, when use of navigational lighting requires modification.

All unnecessary lighting, external or visible from the landing pattern, shall be secured during NVD operations. Hangar lights shall be off or appropriate hangar doors closed while conducting NVD operations. Ships with well decks shall ensure that stern gates and eyebrows are closed with handling room lights out when not conducting simultaneous well deck operations. When conducting simultaneous well deck operations, consideration must be given to minimizing well deck lighting because of the adverse effects of non-NVD-compatible lighting. Ships should make 1MC announcements every 30 minutes during NVD operations to remind personnel of required light discipline. For example: "All hands are reminded that NVD operations are in progress. Maintain strict light discipline throughout the ship."

Recommended shipboard lighting is shown in Figure 11-3.

Plane guard ships shall be notified by ship conducting NVD operations upon commencement/completion of NVD operations. Lighting will be adjusted as necessary, dependent on the plane guard ship's position relative to the ship conducting NVD operations so as to eliminate any interference to the NVD aircraft.

### 11.3.4.2 Flight Deck Lighting

NAVAIR approved NVD-compatible blue flight deck lighting allows for a minimum amount of interference to NVDs, yet ensures adequate lighting on the flight deck for the flight deck crew. When lack of blue lighting exists, ship's lighting may be used at the minimum safe intensity.

The lighting profiles for ships conducting NVD operations (Figures 11-4 and 11-5) are provided as recommendations only. Actual lighting profiles will vary with ambient conditions and aircrew/flight deck personnel proficiency/preference.

**WARNING**

For flight deck personnel using generation II NVDs (AN/PVS5 and AN/PVS7), NVD-compatible lighting may not provide adequate lighting for movement of aircraft and equipment under some ambient lighting conditions.

The following shipboard operations may require additional deck lighting to augment NVD-compatible blue lights, if installed, under some ambient light conditions. These operations are prohibited on "blacked out" flight decks.

1. Chocking and chaining of aircraft.
2. Fueling operations.
3. Ordnance operations (arming/dearming or loading/downloading).
4. Troop movement.
5. Aircrew changes (hotseats).
6. Aircraft movement.
7. Vehicle movement.

Standard LSE and arming supervisor aircraft signaling wands will cause significant NVD washout and effectively blind the aircrews. The LSE and arming supervisor wands will be modified with approved NVD-compatible blue filters available through the Navy stock system.

To prevent possible NVD interference from support equipment vehicles, all tow tractor, crash tractor, and forklift lights shall remain off during NVD operations. To further maintain NVD light integrity, vehicle brake lights shall be covered during NVD operations.

**CAUTION**

Failure to secure or cover non-NVD compatible lighting on support equipment including tow tractors, fork lifts, and P-25s will cause unacceptable interference during the use of NVDs.

Ships modified with approved NAVAIR NVD-compatible blue flight deck lighting are not required to change overhead flood light configurations to launch/recover unaided aircraft. However, deck lighting levels shall be adjusted to provide the unaided aircraft with sufficient lighting for safe launch/recovery references.

Figure 11-3. Navigation Lights

| LIGHTS | POSITION | COLOR | INTENSITY |
|---|---|---|---|
| HOMING BEACONS | MAST | WHITE | OFF |
| RUNNING | PORT SIDE | RED | OFF/DIM |
| RUNNING | STBD SIDE | GREEN | OFF/DIM |
| STERN | STERN | WHITE | OFF |
| MASTHEAD | MAST | WHITE | OFF/DIM |
| TASK | MAST | RED/WHITE | OFF/DIM |

Figure 11-4. Visual Landing Aids

| LIGHTS | POSITION | COLOR | INTENSITY |
|---|---|---|---|
| V/STOL OLS | SUPERSTRUCTURE | AMBER/GREEN | ON — 0% |
| HPI | PORT SIDE | GREEN/RED/WHITE | 0 to 10% |
| SPOT | EACH SPOT | WHITE | 0 to 10% |
| LINE UP | CENTERLINE | WHITE | 0 to 10% |
| NOZZLE ROTATION | BOW | AMBER | 0 to 10% |
| DROP | STERN | RED | OFF |
| DECK EDGE | PERIMETER | WHITE | OFF |
| DECK EDGE | PERIMETER | BLUE | 30 to 100% |
| DECK STATUS | SUPERSTRUCTURE | RED/AMBER/GREEN | 0 to 10% |

Figure 11-5. Illumination

| LIGHTS | POSITION | COLOR | INTENSITY |
|---|---|---|---|
| FLOOD | SUPERSTRUCTURE | LP SODIUM | OFF |
| FLOOD | OVERHEAD | AMBER | 0 to 10% |
| FLOOD | OVERHEAD | BLUE | 0 to 100% |
| DECK SURFACE | PERIMETER | BLUE | 0 to 100% |

### 11.3.4.3 Bridge, Primary Flight Control, and Flight Deck Control Lighting

All unnecessary lighting will be secured. Indicator lights will be taped over or secured to eliminate glare. If lighting is required inside these spaces, compatible blue filtered flashlights or very dim internal lighting on critical instruments will be used.

**CAUTION**

Red lights in the vicinity of missile launchers, SRBOC launchers and CIWS mounts may cause interference during NVD operations.

### 11.3.5 NVD Flight Operations Procedures

Simultaneous NVD-aided and unaided flight operations are permitted in the control zone. However, simultaneous NVD-aided and unaided operations in the landing pattern are prohibited. In order to maintain optimum lighting conditions for the landing environment all aircraft in the landing pattern shall be the same configuration (either NVD-aided or unaided).

**WARNING**

- Simultaneous NVD-aided and unaided operations in the control zone increases the risk of a mid-air collision. Aircraft Commanders shall ensure their lighting configuration is set to be visible to all aircraft in the control zone.
- Simultaneous NVD-aided and unaided operations should be avoided in the same holding pattern due to reduced visual acuity of the unaided aircrew.
- In-flight transition from aided to unaided flight may be disorienting. Sufficient time shall be allowed for aircrew to adapt to the unaided flight regime, prior to recovery.

**Note**

At a minimum, the last aircraft in a formation will have anti-collision lights on.

Lighting management by aircrew is critical for safety of flight and efficient deck operations. Aircraft should secure anti-collision lights on final approach. Position lights shall be illuminated at all times. Aircraft equipped with NVD formation lights should utilize them to the maximum extent possible.

Deviations of lighting configuration (blacked out/no anti-collision lights) for tactical missions may be approved by the Air Officer on a case-by-case basis.

Cross cockpit landings offer reduced visual cues and should only be practiced to satisfy pilot currency requirements or instruction for deck landing qualification.

**WARNING**

Landing forward or aft of an adjacent, occupied spot may be hazardous due to depth perception limitations associated with NVDs.

If the ship is required to conduct the recovery of an unaided aircraft during NVD operations, the pattern NVD aircraft shall be held on deck or placed in a marshal/delta pattern. The flight deck lighting will be raised to normal intensity and the unaided aircraft recovered. Mixed helicopter types in a NVD landing pattern is authorized.

During NVD cargo operation, the USN Mk 105 pendant should be used, if possible, to minimize hover altitude. The Mk 92 pendant is authorized for NVD use. Chemical lights should be used to mark hookup points (pendant and load). They shall be securely attached to minimize FOD potential. Flight deck lighting should be at the maximum intensity practicable given the NVD compatibility and aircrew/flight deck crew comfort level/proficiency.

NVD Helicopter Rope Suspension Training (HRST) operations are authorized given the same lighting concerns as cargo operations. The intended point of landing for personnel exiting the aircraft will be clearly visible.

Ordnance operations are authorized after the completion of stage two training. Ordnance operations shall be conducted in accordance with published shipboard procedures. The flight deck shall be illuminated sufficiently to conduct loading/downloading and arming/dearming without NVDs.

### 11.3.6 Emergencies During NVD Operations

Aircraft emergencies shall be handled in accordance with the applicable aircraft NATOPS manual. Ship/flight deck emergencies shall be handled in accordance with the ship's SOP/Helicopter Operations Bill and as briefed with aircrews. Night SAR will be conducted by surface craft or automatic hover capable aircraft only. Consideration should be given during actual night SAR to utilize aircrews equipped with NVDs to aid in the search.

### 11.4 MULTISERVICE HELICOPTER OPERATIONS

Characteristics and capabilities of U.S. Army and U.S. Air Force helicopters are presented in Appendix H. Typical multiservice spotting arrangements are contained in Appendix E.

### 11.5 U.S. NAVY MULTINATIONAL ROTARY AND FIXED WING OPERATIONS

Information governing U.S. rotary and fixed wing interoperability with foreign navies is under the Multinational Through-Deck and Aircraft Carrier Crossdeck Operations (MTACCOPS) and the Helicopter Operations from Ships other Than Aircraft Carriers (HOSTAC) programs. These programs use standards and national data contained within the MPP-02 series of publications.

For planning purposes, the current certification status of all U.S. ships, or the capability of foreign ships can be obtained immediately by contacting the Naval Air Warfare Center Aircraft Division, Lakehurst, NJ at DSN 624-2592 or commercial (732) 323-2592 or contact via email at aviation_certification_hotline@navy.mil.

Refer to MPP-02, MPP-02.3 and associated Experiment Tactics (EXTACS) for procedures, operational standards, planning and briefing checklists, MTACCOPS Ship Helicopter Operating Limits (SHOL), Ship Tiltrotor Operating Limits (STROL), VERTREP, Multinational Onboard Delivery procedures, and MTACCOPS/HOSTAC qualifications. Refer to MPP-02.1 and MPP-02.2 Technical Supplements for general national technical information on multinational through-deck and aircraft carriers, Ship/Aircraft Interoperability Matrix, specific flight deck data and restrictions, host ship national procedures such as approach and departure procedures, and detailed national aircraft data. These publications are distributed to all commands twice a year via the Allied Publication Electronic Library (APEL) DVD Disc 1. When U.S. ships and U.S. aircraft conduct crossdeck operations with non-U.S. aircraft or non-U.S. ships, a crossdeck operations (XDECK) report shall be submitted as per MPP-02. Reports should be submitted via email to cnaf_hostac@navy.mil.

## CHAPTER 12

# Cleanliness of Decks/FOD Prevention

### 12.1 GENERAL

The cleanliness of the flight deck, catwalks, scuppers, and hangar deck, and the prevention of foreign object damage (FOD) to aircraft engines shall be an all hands' responsibility. FOD is a principal cause of aircraft engine failure or damage that necessitates costly and time-consuming repairs and reduces operational readiness and combat effectiveness. Flight or hangar decks that are saturated or slippery due to Petroleum Oil and Lubrication (POL) spills can result in an aircraft sliding out of control and being damaged. In extreme cases, FOD and fluid spills can lead to the destruction of an aircraft and result in injury or death to personnel. A successful program that combats FOD and fluid spills requires active all hands participation in their prevention, timely reporting, and a thorough cleanup.

### 12.2 RESPONSIBILITIES

Cleanliness and FOD prevention shall be a joint responsibility of the air department, the embarked ACE, and all other departments/units that utilize any portion of the flight and/or hangar deck. Specific duties are delineated below. Zero tolerance for FOD shall be the goal.

#### 12.2.1 Aircraft Handling Officer

The Aircraft Handling Officer (ACHO) shall be assigned as FOD Prevention Officer. ACHO duties are to perform the following:

1. Implement a vigorous FOD prevention and cleanliness program through all hands education and involvement, enforce high standards of flight and hangar deck cleanliness, and ensure that all possible measures for FOD prevention are taken.
2. Make recommendations to proper authority as to means of improving this program.
3. In collaboration with the ACE maintenance officer, assign a FOD supervisor.
4. Schedule a daily FOD walkdown while in port. Upon leaving port, two FOD walkdowns shall be completed prior to the first launch.
5. Ensure FOD Instruction is established and signed by the ships CO and the ACE Commander.

#### 12.2.2 Flight Deck Officer

The Flight Deck Officer (FDO) shall assist the ACHO in the performance of duties. Additionally, the FDO shall be tasked with overall flight deck cleanliness. FDO duties shall include the following:

1. Ensure that padeyes, scuppers, safety nets, catwalks, and all other FOD retaining areas of the flight deck are cleaned regularly.
2. Develop an aggressive program of scrubbing the flight deck.
3. Ensure all support equipment and power hatches are opened and inspected during FOD walkdowns.
4. Advise the ACHO that an aircraft is not ready to be respotted due to FOD/fluid spills in the immediate vicinity of the aircraft.
5. Monitor the condition of the flight deck non-skid and effect required repair.
6. Make recommendations to the ACHO for improvements to the program.

### 12.2.3 Hangar Deck Officer

The Hangar Deck Officer (HDO) shall assist the ACHO in the performance of duties. Additionally, the HDO shall be tasked with overall hangar deck cleanliness. HDO duties are to perform the following:

1. Develop an aggressive program of scrubbing the hangar deck.
2. Ensure that padeyes and all other FOD-retaining areas of the hangar deck are cleaned regularly.
3. Advise the ACHO that an aircraft is not ready to be respotted due to FOD/fluid spills in immediate vicinity of the aircraft.
4. Monitor the condition of the hangar deck non-skid and effect required repair.
5. Make recommendations to the ACHO for improvements to the program.

### 12.2.4 Aviation Fuels Maintenance Officer

The Aviation Fuels Maintenance Officer shall provide the FOD team with two fuel spill carts.

### 12.2.5 ACE Commanding Officer

The ACE commanding officer, through the ACE Maintenance Officer, shall:

1. Implement and supervise FOD and spill prevention training programs for ACE personnel stressing such points as:
   a. Active participation of all hands, including supervisory personnel for all FOD walkdowns.
   b. Wearing proper flight deck uniform during flight operations and ensuring proper marking, stowage, and security of hand tools and large gear.
   c. Policing the area around all aircraft to ensure that rags, safety wire, tools, and loose parts are accounted for and removed following maintenance or prior to any engine turn-up.
   d. The necessity of preventing spills of petroleum-based fluids and grease on the flight or hangar decks.
2. Ensure that drip pans are utilized whenever maintenance requires a hydraulic jenny and/or could result in fluid spillage.
3. Provide a dedicated Spill Tiger Team to immediately respond to clean up large spills.
4. Prior to embarkation, assign specific areas of responsibility for policing the flight deck, hangar deck, and catwalk areas.
5. Ensure that prior to an aircraft reported as up and ready for movement, the area around the aircraft is clean and free of any FOD or fluid spills.
6. Ensure that adequate numbers of personnel, particularly supervisory personnel, participate in FOD walkdowns.
7. Ensure that petroleum-based fluids are not dumped into the flight deck scuppers.

### 12.2.6 All Hands

1. Eating, drinking, chewing tobacco, and smoking are prohibited at all times on the flight deck, catwalks, hangar deck, and exposed areas in the island structure.
2. The wearing of hats or other loose articles of clothing is prohibited in the vicinity of operating aircraft engines. This particularly applies during aircraft engine turnups in port and to personnel viewing flight operations from exposed areas on the island structure.
3. No individual shall carry rags, papers, magazines, or other loose gear on the flight deck during flight operations. FOD security pouches shall be worn to accommodate essential items required for flight operations that may be susceptible to falling on the flight deck.

### 12.2.7 All Departments

1. Ensure that areas assigned to or utilized by them on either the flight or hangar decks are maintained in a clean, “FOD free” condition as discussed herein. Specific areas of concern are fasteners, safety wire, tools and loose parts adrift on ground support equipment or boats, and trash or debris left on the deck and elevators after UNREPs, CONREPs, or Vertical Replenishments (VERTREPs).
2. Provide participants for FOD walkdowns.
3. Ensure that any large item received or transferred is plainly marked with the name of the recipient/sender.
4. Items that require/need stowage on hangar deck are coordinated with the ACHO.

## 12.3 FOD PREVENTION METHODS

There are many methods of FOD prevention that combine to greatly reduce FOD potential. Among these required methods are:

1. FOD walkdowns.
2. Clean maintenance.
3. FOD bags/containers/pouches.
4. Flight deck scrubber/sweepers.
5. Air/electric-driven vacuum cleaners/magnetic brooms.
6. Tool control.
7. Intake and exhaust covers.
8. Taping/covering aircraft accesses during long-term maintenance/long down time.
9. All hands education.
10. Command emphasis.
11. Enforcement methods.
12. Incentive programs.

## 12.4 CLEANLINESS ENHANCEMENT

The decks and associated areas must be kept as neat and clean as possible to provide an acceptable level of safety and operational effectiveness, particularly when the criticality of aircraft movement and maintenance is considered. Likewise, equipment, tools, and maintenance-related items must be properly stowed and secured to reduce FOD hazards, to maintain material conditions, to prevent losses and associated replacement expenses, and to provide the desired level of safety and operational effectiveness. It is essential that users of the areas participate and cooperate in the overall effort to maintain an optimum state of cleanliness and security. Many methods exist, that when combined, greatly reduce deck slickness and POL buildup. Required methods are:

1. Clean maintenance practices.
2. Use of drip pans, fuel buckets during engine shutdown, etc.
3. Immediate cleanup of all fluid spills.
4. FOD walkdowns.
5. Scrubbers, sweepers, vacuums, etc.
6. Command emphasis and all hands participation and education in a zero-tolerance FOD program.
7. Stowage of power cables, hoses, support equipment, etc.

The ACHO shall assign specific areas of responsibility (AOR) on the flight and hangar decks to embarked squadrons and ships divisions/departments. The ACEMO or representatives shall have a daily signoff sheet.

# APPENDIX A

# Aircraft Launch and Recovery Limitations

## A.1 WIND AND SHIP MOTION LIMITATIONS

Flight operations of aircraft aboard LHA and LHD type ships are limited by relative wind over deck. Rotary wing aircraft are subject to maximum allowable wind restrictions for (1) unrestrained rotor blades, (2) folding and unfolding rotor blades, (3) starting engines, (4) engaging and disengaging rotors, and (5) launching and recovering aircraft. The wind envelopes in this appendix address Chapters 5 and 6 engine start and engagement and aircraft launch and recovery limitations. A Ship-Helicopter Interoperability Reference Table (SHIRT) is provided (Figure A-1) for a quick reference for the aircrew.

Gusting winds and airwake turbulence may combine to disrupt the ship's airwake in the vicinity of an aircraft. Sources of ship airwake turbulence include (1) the ship's superstructure; (2) hull/deck protrusions, vehicles and equipment; (3) stack exhaust gases; and (4) the rotor wash/jet blast caused during the taxiing, takeoff and landing of adjacent aircraft.

**Note**

Aircrew, LSEs, and PriFly personnel shall maintain situational awareness to the airwake environment in the vicinity of spots which aircraft are being launched from and recovered to.

Unless otherwise noted, the rotor engagement and disengagement, and the aircraft launch and recovery wind envelopes in this appendix:

1. Are based on steady state winds measured by an upwind mast-mounted anemometer.

**CAUTION**

Aircraft damage may occur due to considerable differences between the flight deck winds and those measured by mast-mounted anemometers.

2. Are defined relative to the ship's centerline.
3. Are valid for all landing spots or restricted to the spots indicated on the wind envelope.

## A.2 ROTOR ENGAGEMENT AND DISENGAGEMENT LIMITATIONS

Rotor engage/disengage limitations are defined by the general engage/disengage limits of the respective aircraft NATOPS. More restrictive wind limitations are required for specific aircraft and spot combinations as presented in this appendix.

## A.3 AIRCRAFT LAUNCH AND RECOVERY LIMITATIONS

**Note**

- For AV-8B launch and recovery limitations, refer to the AV-8B Shipboard Operating Bulletin.
- For F-35B launch and recovery limitations, refer to Paragraph A.8.

Unless otherwise noted, the aircraft launch and recovery wind envelopes in this appendix:

1. Are valid for a normal approach to the spot, with the helicopter aligned with the ships centerline at touchdown (AV-8B/F-35B may be oriented cross-axially or aft).

**CAUTION**

Launch and recovery should be timed to coincide with quiescent periods of ship motion.

**Note**

Excessive ship motion in conjunction with ship airwake turbulence can greatly increase the difficulty of launch and recovery operations.

2. Are valid for the PAC in either seat.

3. Are valid for all NATOPS approved aircraft loading configurations, Gross Weight (GW), and Center of Gravity (c.g.). conditions in accordance with applicable operators/NATOPS manuals provided power available exceeds power required to hover out of ground effect.

**WARNING**

Failure to plan for an adequate power margin may result in $N_r$ droop and corresponding loss of tail rotor authority.

**Note**

- Aircraft NATOPS zero wind HOGE torque is often the best approximation to shipboard hover torque requirements for all wind conditions; however, an additional power margin of 5 to 10 percent torque may be required to approach, overcome turbulence, decelerate, or depart the flight deck vicinity.
- Envelope regions exhibiting hover requirements in excess of NATOPS zero wind HOGE torque requirements are typically designated by an appropriate caution.

4. Have night envelope limits that are shaded to distinguish them from day limits.

5. Have night envelopes that are valid for NVD and non-NVD operations under all certified ship lighting configurations.

6. Leave ship pitch and ship roll limitations to the judgment of the ship's CO and the embarked squadron commander.

## A.4 F-35B DECK STRUCTURE RECOVERY LIMITATIONS

F-35B certified decks in LHD-1 and LHA-6 class ships are designed to support increased thermal and velocity loading from F-35B operations at spots not labeled "For Emergency Use Only" in Appendix A.8. VLs to spots other than those spots on F-35B certified decks or to any spot on non F-35B certified deck are not authorized except in the event of an emergency.

**CAUTION**

- Landings to alternate spots may result in damage to ship structure.
- Overflight of deck edge life raft containers forward of spot 7 may result in dislocation of containers.

F-35B landing interval shall adhere to NAVSEA thermal guidance documented in the AVCERT. F-35B landing interval thermal guidance on F-35B certified decks may be refined with the use of the Thermal Exposure Deck Structural Acceptability Prediction (TEDSAP) tool.

**CAUTION**

Failure to observe minimum deck cool down times may result in structural damage and reduce overall service life of deck structure.

F-35B VLs create significant downwash on aircraft, personnel, and equipment in the vicinity of the VL aircraft. All non-essential personnel shall remain clear of the alternating red and white Fixed Wing Safe Parking Line. For other aircraft in the vicinity of an F-35B VL, all attached panels and canopies shall be closed, and all equipment and rotor blades shall be secured during VLs.

**WARNING**

Failure to remain clear of the Fixed Wing Safe Parking Line during F-35B VLs may result in injury to personnel.

**CAUTION**

Conducting VLs in the vicinity of other aircraft may result in damage to other aircraft if any canopies, panels, rotor blades, etc. are not closed/secured.

In cases where the VL wind envelopes differ between this General Series NATOPS, SLRP, and MORIAH, this General Series NATOPS shall be used as the correct source for limitations.

### A.4.1 F-35B RECOVERY GUIDANCE

F-35B outwash can create hazards to flight deck personnel, equipment, nearby aircraft, and itself. F-35B certified decks on LHD-1 Type and LHA-6 Type ships have arranged deck edge equipment to accommodate 90 to 45 degree forward facing deck crossings to support VLs at spots 7, 7.5 and 9. Deck crossings at spots other than 7, 7.5 and 9, non-standard deck crossing angles at spots 7, 7.5 and 9, and deck crossings on non F-35B certified decks may damage catwalk and deck edge equipment and generate FOD. Deck crossing shall avoid passing over catwalk and deck equipment to the maximum extend as practical.

**WARNING**

Deck crossing over catwalk and deck edge equipment may result in the creation of FOD. Resulting FOD may injure personnel or damage aircraft and equipment.

**CAUTION**

- F-35B exhaust can damage aircraft, ship structure, ship equipment, and ground support equipment.
- Fixed-wing downwash and exhaust may result in damage to the port side radome and other deck edge equipment, resulting in a FOD hazard. Where practicable for F-35B only, a 90-degree deck edge crossing is desired to ensure safe separation from equipment.
- Stern crossover on non F-35B modified decks may damage SPN-41.
- Port side cross over to spot 7 or 7.5 on non F-35B modified decks may damage SATCOM radome.

The Fixed Wing Tramline and associated deck lights on F-35B certified decks have been shifted to port to provide fixed wing aircraft a safe distance from the Fixed Wing Safe Parking Line for STO and VL operations. When landing on non F-35B certified decks, consideration should be given to the VL landing spot and aircraft and equipment near the safe park line to ensure adequate clearance.

**Note**

- On ships that are F-35B certified, the Fixed Wing Tramline is shifted 3 feet 6 inches to port, including associated markings and deck lighting. Tramline lights have been decreased from 20 light pairs to 14 light pairs, which increased spacing. Vertical line-up light (drop-down light) is now aligned with starboard tramline lights. The hover position indicator (HPI) and V/STOL optical landing system (OLS) have been adjusted for the new tramline location. Wind diagrams were not affected by this change, and sufficient spacing between V/STOL aircraft to ship structures and port deck edge has been maintained.
- Recovering F-35B produces large amounts of salt spray and high noise levels. The port elevator hangar door should be closed during F-35B recoveries.

## A.5 SHIP HELICOPTER INTEROPERABILITY REFERENCE TABLE (SHIRT)

The Ship Helicopter Interoperability Reference Table (SHIRT) (Figure A-1) provides direction to aviators on the approved envelopes for a given helicopter and ship combination. As a quick reference, it also summarizes the operational capability of the fleet in general. If a cell of the table is empty, it indicates that no envelope exists for that combination, therefore launch and recovery operations are prohibited. For Navy/Marine corps owned or contracted aircraft operating in support of the Navy/Marine Corps, the envelopes provided represent airworthiness approval. For all other aircraft, the envelopes provided are recommendations only and airworthiness approval for shipboard operations must be received by the operator's respective airworthiness authority prior to operating at the ship. The SHIRT provides information only relating to the launch and recovery envelopes and the presence of an envelope does not infer that a valid aviation facilities certification is in place for a given ship. Aircrew must consult the Aviation Facilities Resume for the most up to date certification information for the ship.

## A.6 WIND LIMIT ORIENTATION

The wind limits shown on the envelopes are the maximum allowable wind speed and direction over the deck. Helicopter and landing spot combinations where the common envelope is required by the SHIRT, the limits of the common envelope are oriented relative to the nose of the aircraft on touchdown. For all other envelopes, the wind limits are oriented relative to the ship centerline.

## A.7 WIND ENVELOPE RESTRICTIONS

Wind envelopes (Figures A-2 through A-94) are generally based on flight test engineering data. In some cases, lack of specific engineering flight test data may cause some envelopes to be more restrictive than if flight test data were available. Questions about the wind envelopes should be addressed to:

Commander
Naval Air Systems Command (AIR 4.0P)
Bldg 460
22244 Cedar Point Road
Patuxent River MD 20670-1163

1. For V-22 VTOL shipboard launch and recovery operations, Torque Margin planning shall be referenced from Mission Planning Mast Torque Available and is as follows (unless higher margins are denoted on applicable launch and recovery envelopes):

| WIND OVER DECK (KTS) | ZERO WIND HOGE TORQUE MARGIN |
|---|---|
| ≤5 | 15% |
| >5 | 10% |

**WARNING**

Failure for V-22 to account for shipboard launch and recovery envelope torque margin planning may result in power required exceeding power available, resulting in unrecoverable descent rates and possible loss of aircraft.

**CAUTION**

The V-22 may experience large uncommanded roll due to interaction with upwind aircraft wake while on deck with rotors turning.

**Note**

- V-22 Launch/Recovery shall be conducted to/from H-53 mainmount wheelboxes.
- For specific wind conditions, the additional Torque Margin is required for V-22 to overcome external air wake disturbances. In the vicinity of the flight deck edge, external air wake disturbance may be amplified if the approach stagnates near the deck edge.

Figure A-1. Ship-Helicopter Interoperability Reference Table (SHIRT) for LHA/LHD

| SHIP | LANDING SPOT | H-60 | V-22 | H-53 | AH-1W | AH-1Z | UH-1Y | H-57 | H-3 | H-6 | H-47 | H-58 | H-64 | H-65 | EC-225 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LHA-6 Type LHD-1 Type | Spot 1 | A-2 | — | A-18 | A-4 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 | |
| | Spot 2 | A-23 | A-29 | A-18 | A-5 | A-10 | A-14 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 | |
| | Spot 3 | A-2 | A-35 | A-18 | A-9 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 | |
| | Spot 4 | A-24 | A-30/ A-36 (STO) | A-18 | A-6 | A-11 | A-15 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 |
| | Spot 5 | A-25 | A-31 | A-19 | A-7 | A-12 | A-16 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 |
| | Spot 6 | A-26 | A-32 | A-20 | A-8 | A-13 | A-17 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 |
| | Spot 7 | A-27 | A-33 | A-21 | A-9 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 |
| | Spot 8 | A-28 | A-35 | A-18 | A-9 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 | |
| | Spot 9 | A-2 | A-34 | A-22 | A-9 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 | A-2 |

Notes:

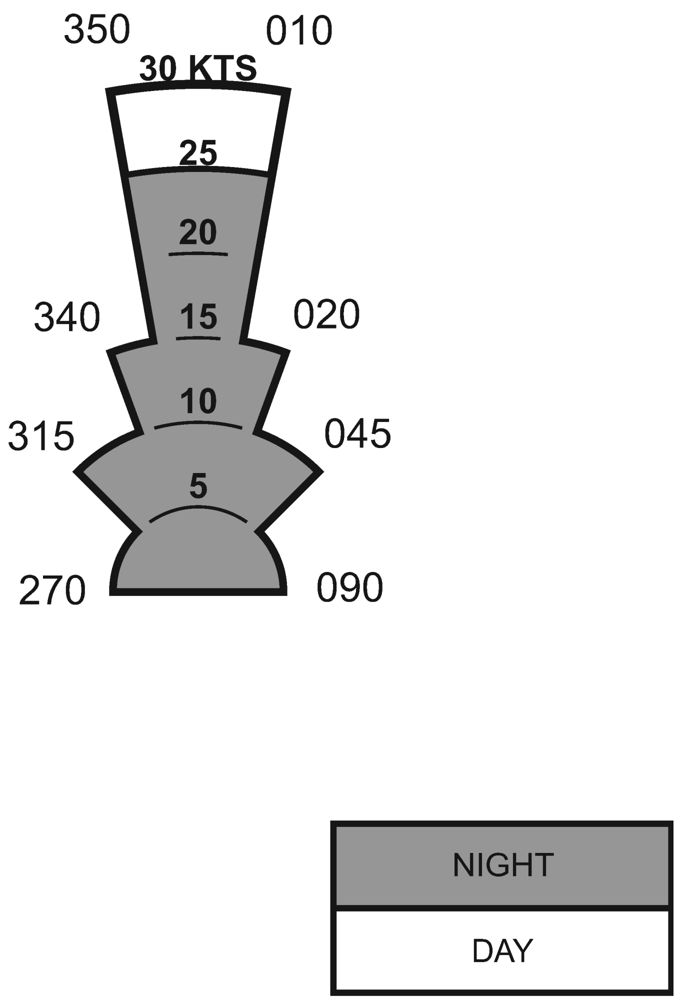
1. Empty cells indicate that no operational capability to launch or recover exists for that ship and helicopter combination.
2. This table does not indicate or infer a valid aviation facilities certification for any ship. Consult the ship's current AVCERT for details on the certification level and type.
3. Launch and recovery envelopes provided for Non Navy/Marine corps aircraft are recommendations only. Consult respective service's airworthiness authority for approval of shipboard operations.

Figure A-2. LHD 1/LHA 6 Common Launch and Recovery Envelopes

AAS-COMMON-01A

**NOTE**

HELICOPTER ALIGNED WITH SHIP'S LINEUP LINE AND WIND SHOWN RELATIVE TO AIRCRAFT'S NOSE. IF THE SHIP'S LINEUP LINE IS NOT FORE/AFT, THEN THIS ENVELOPE WILL BE ROTATED TO THE ANGLE OF THE LINEUP LINE.




**LHD 1 / LHA 6 COMMON LAUNCH AND RECOVERY ENVELOPES**

Figure A-3. AH-1W Engage/Disengage Envelopes — LHD and LHA-6 Type Ships — Spots 1 thru 7

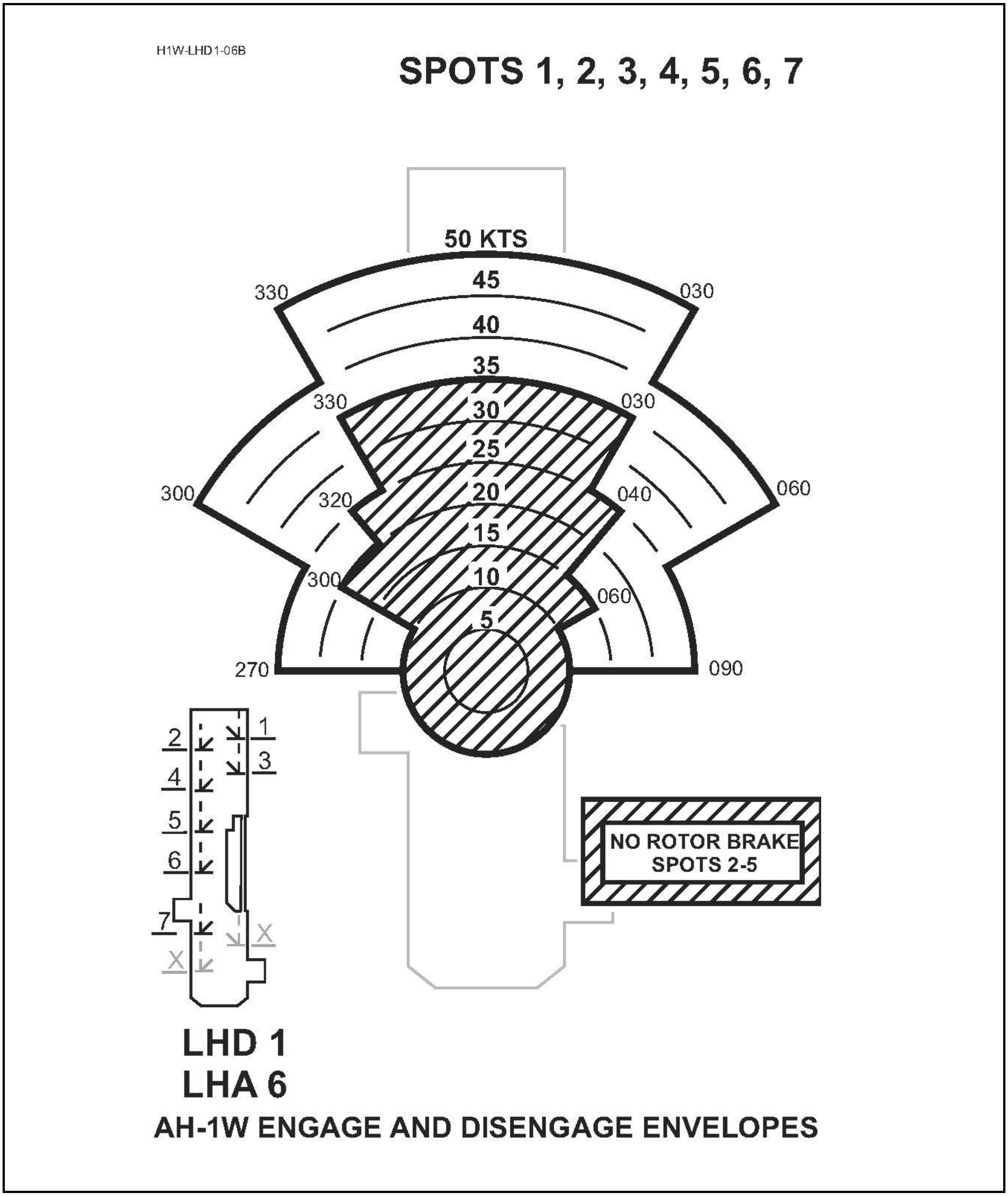


Figure A-4. AH-1W Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spot 1

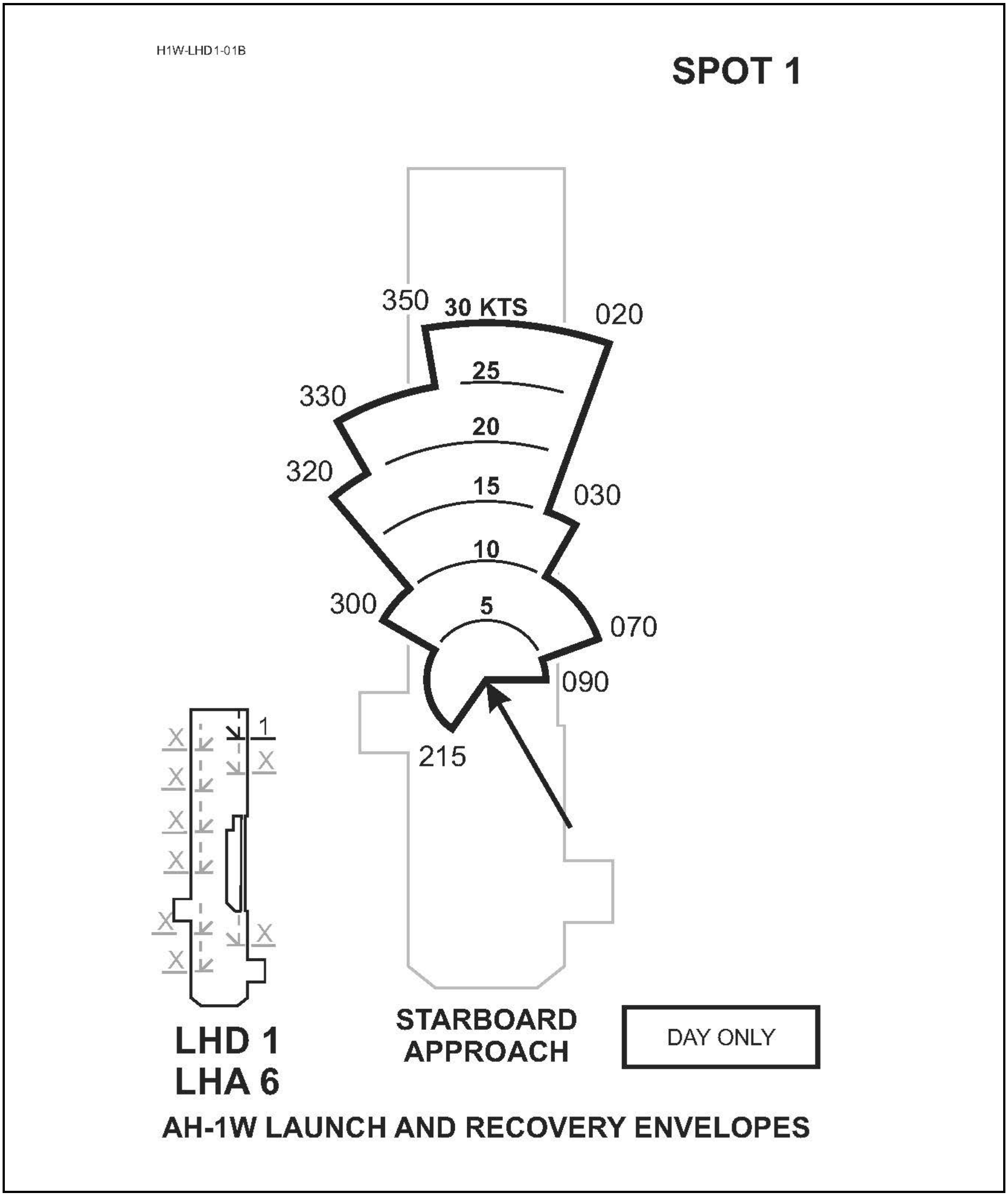


Figure A-5. AH-1W Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spot 2

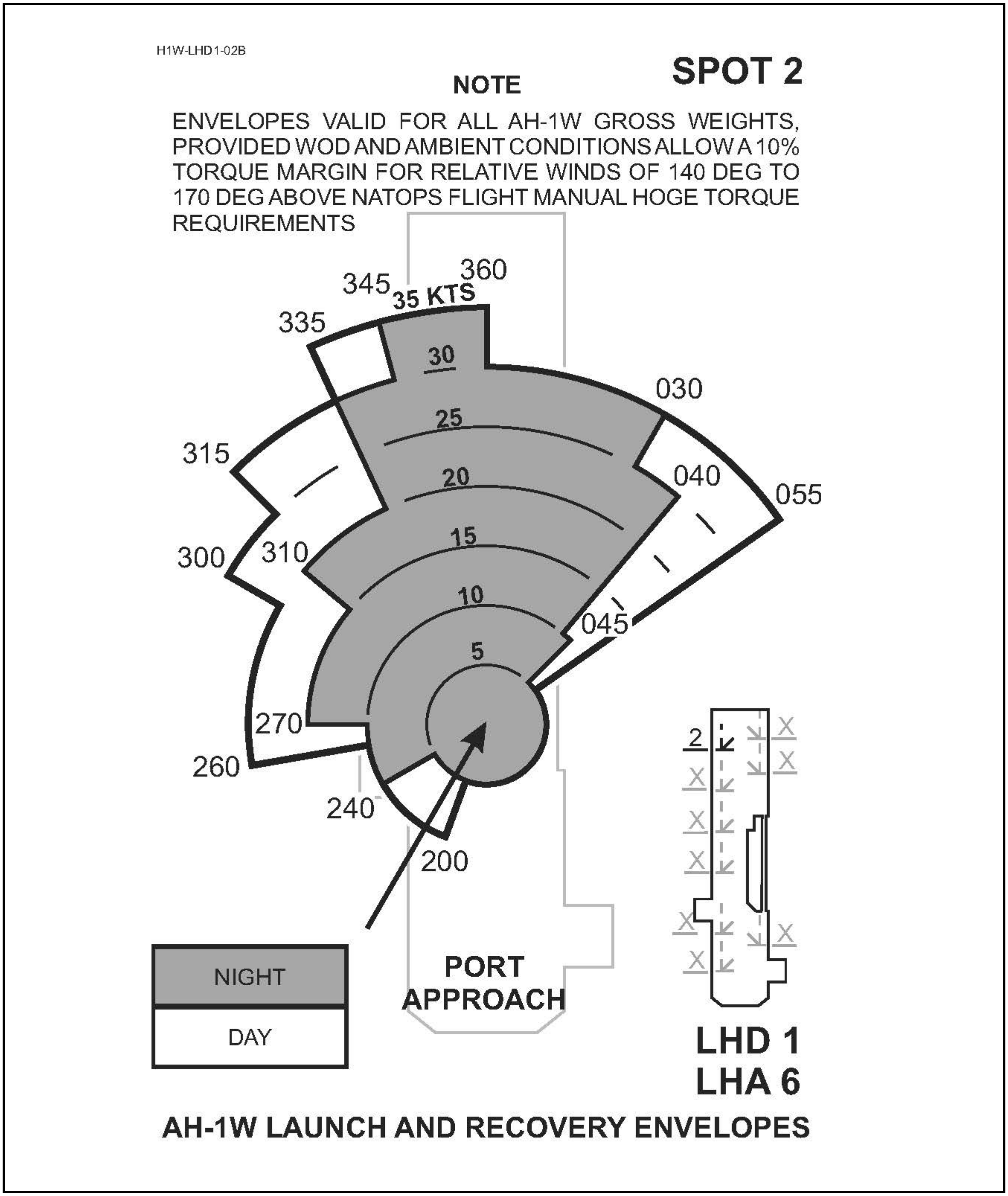


Figure A-6. AH-1W Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spot 4

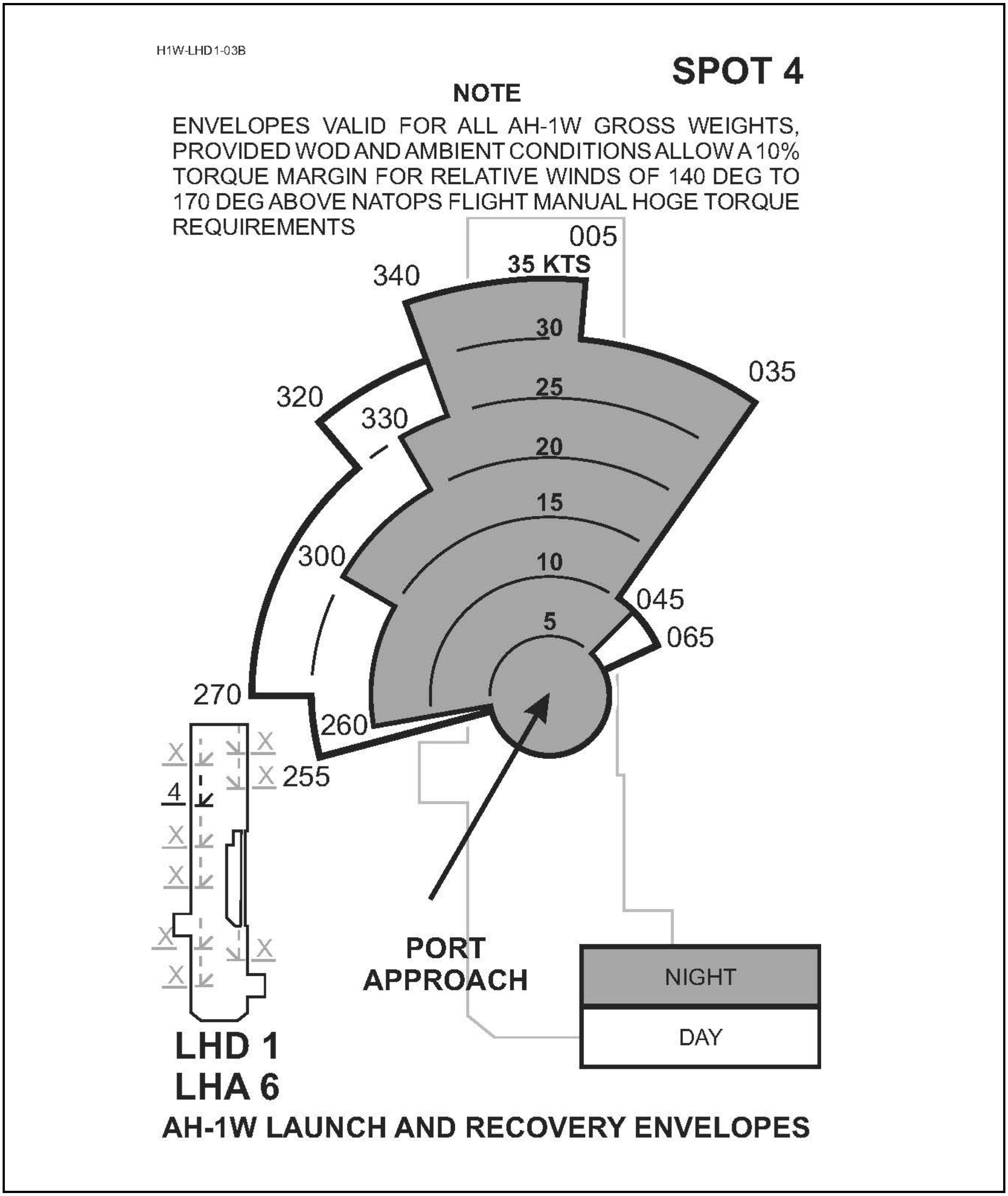


Figure A-7. AH-1W Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spot 5

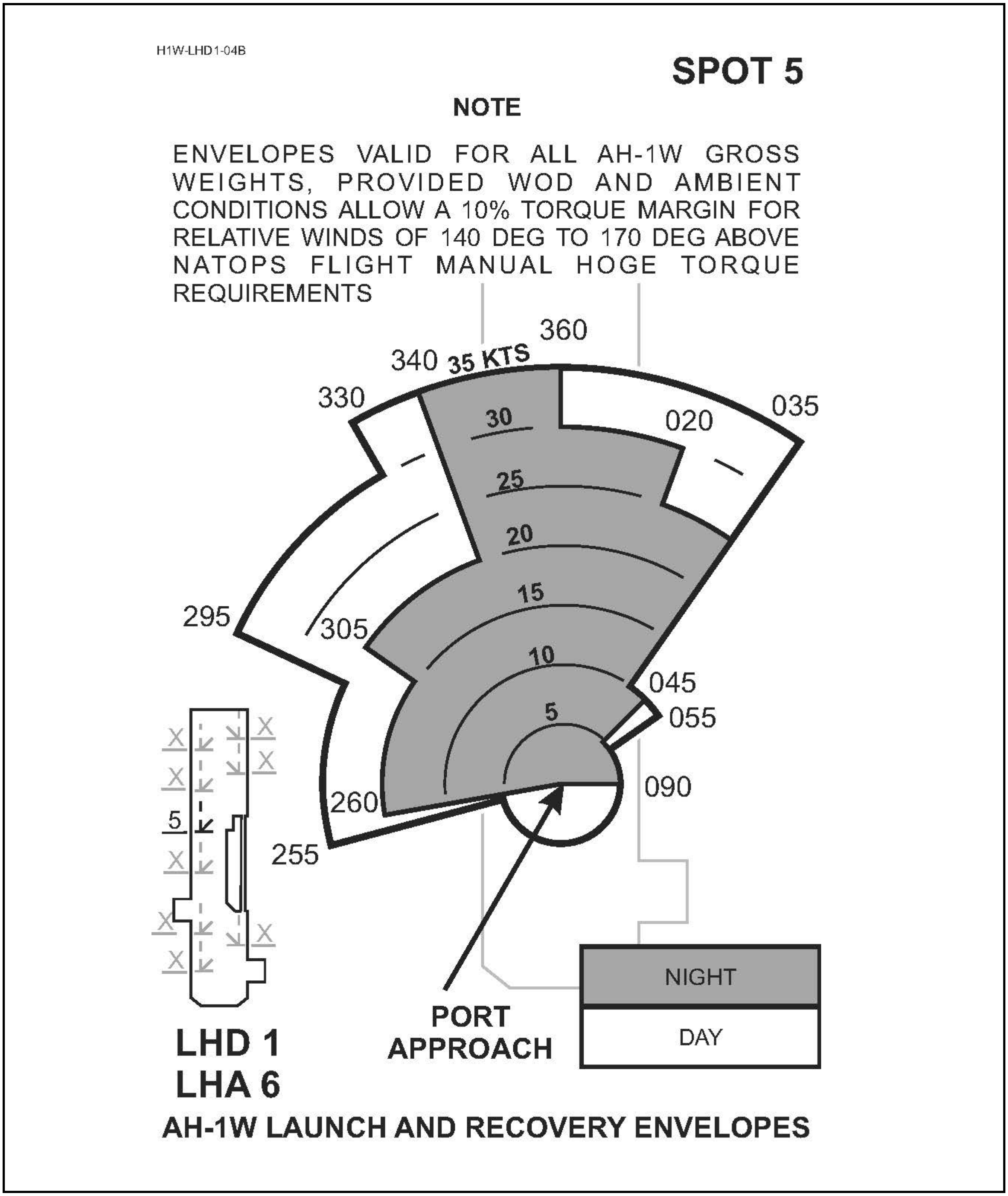


Figure A-8. AH-1W Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spot 6

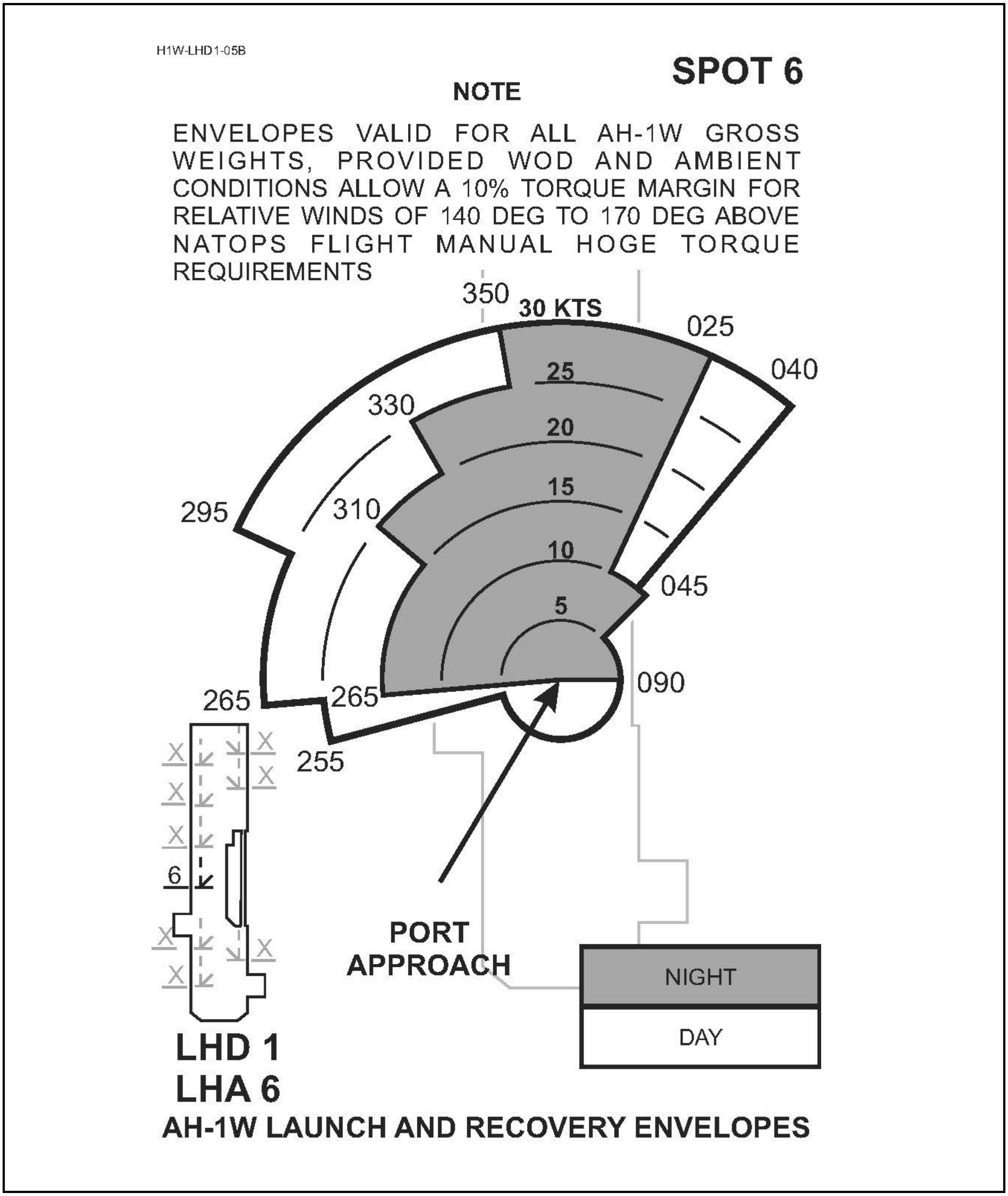


Figure A-9. AH-1W Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spots 3, 7, 8, 9

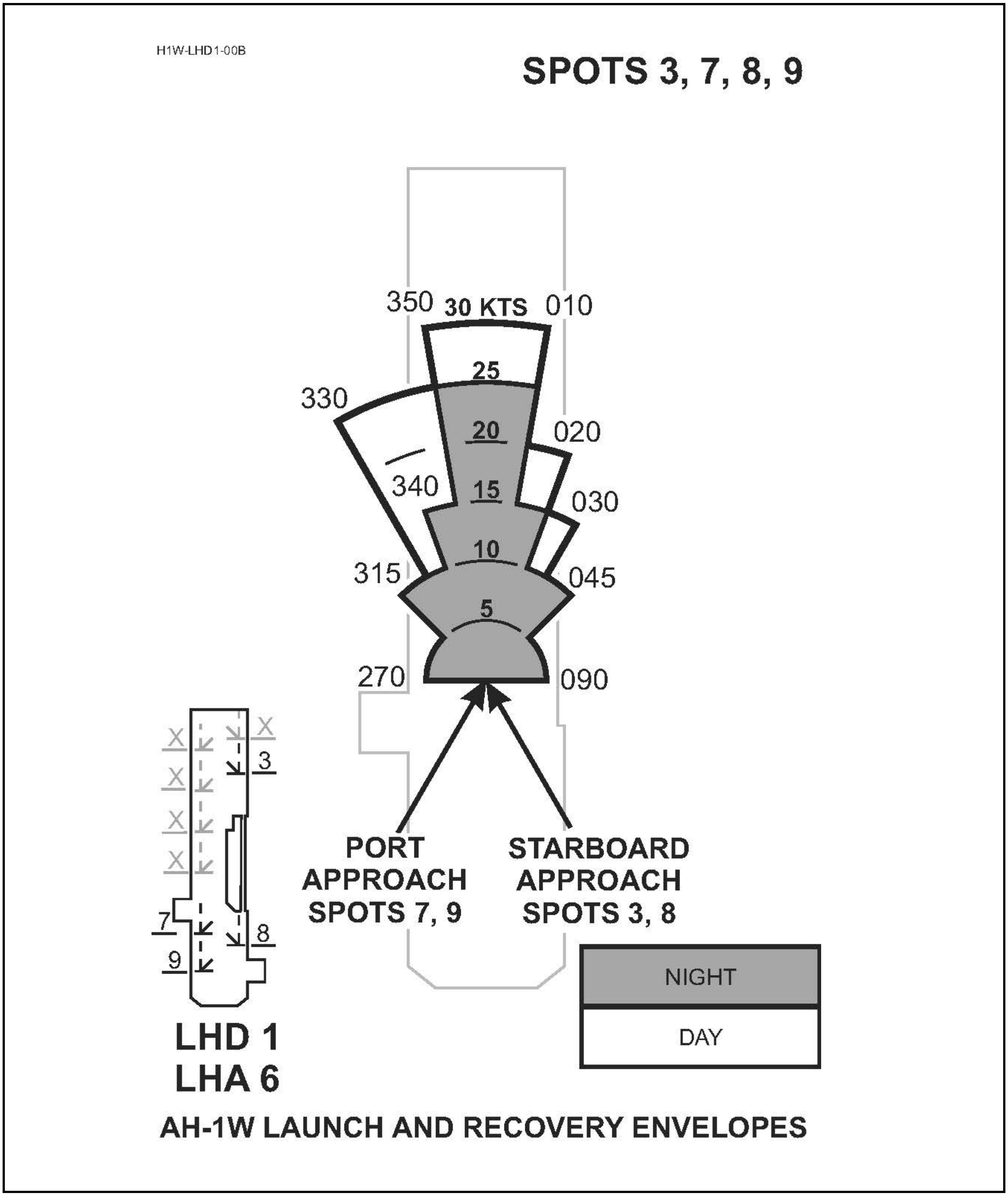


Figure A-10. AH-1Z Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spot 2

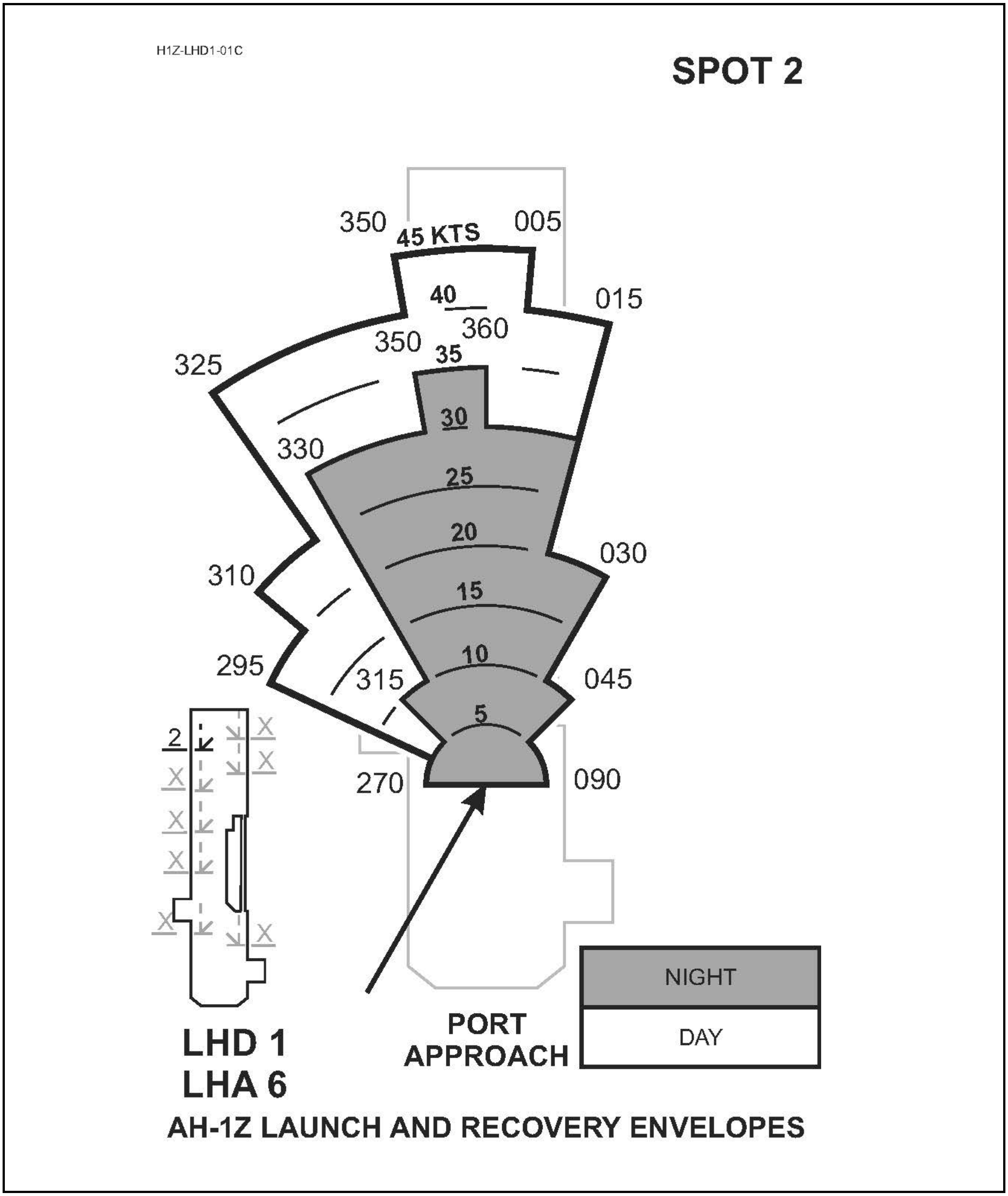


Figure A-11. AH-1Z Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spot 4

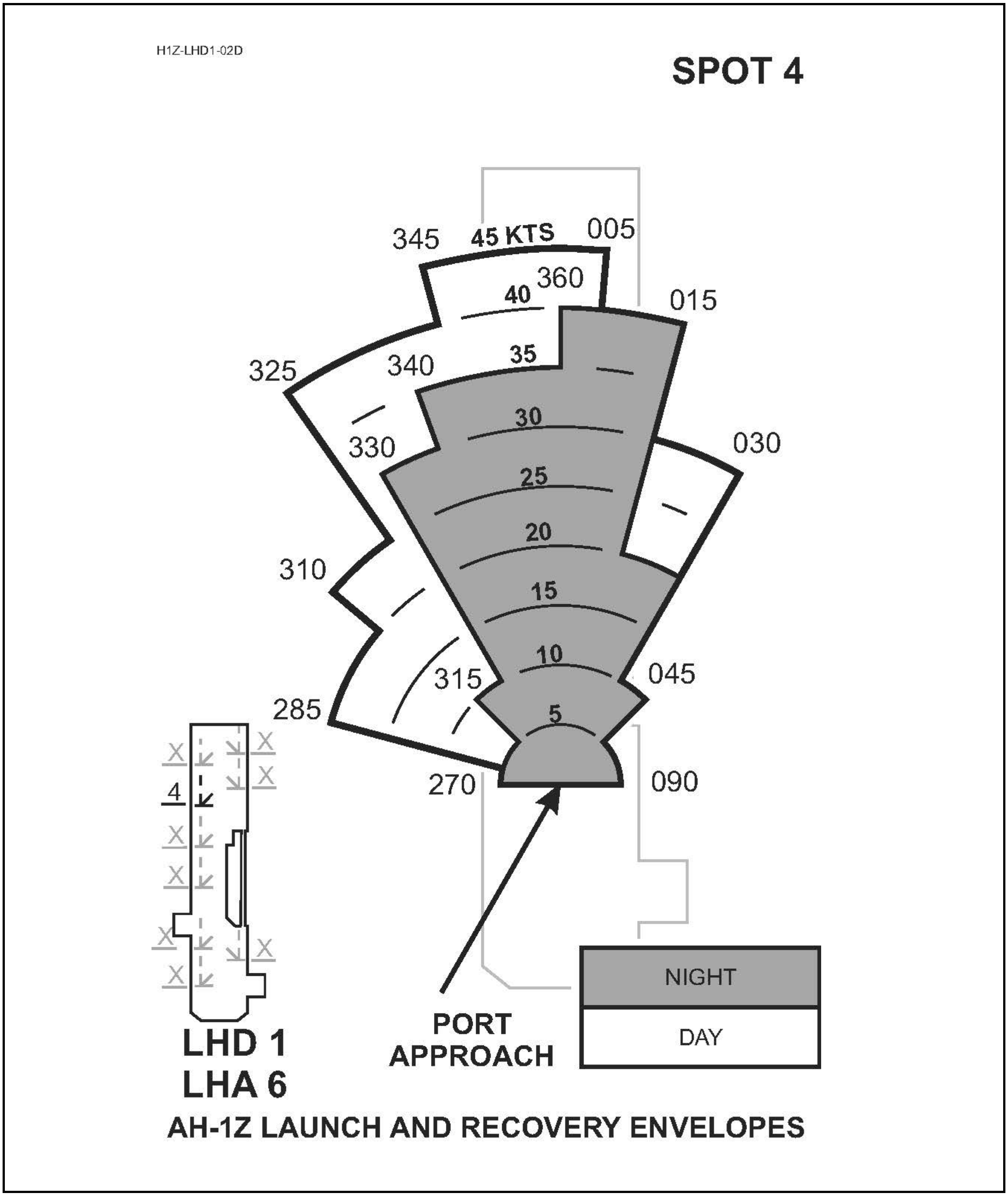


Figure A-12. AH-1Z Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spot 5

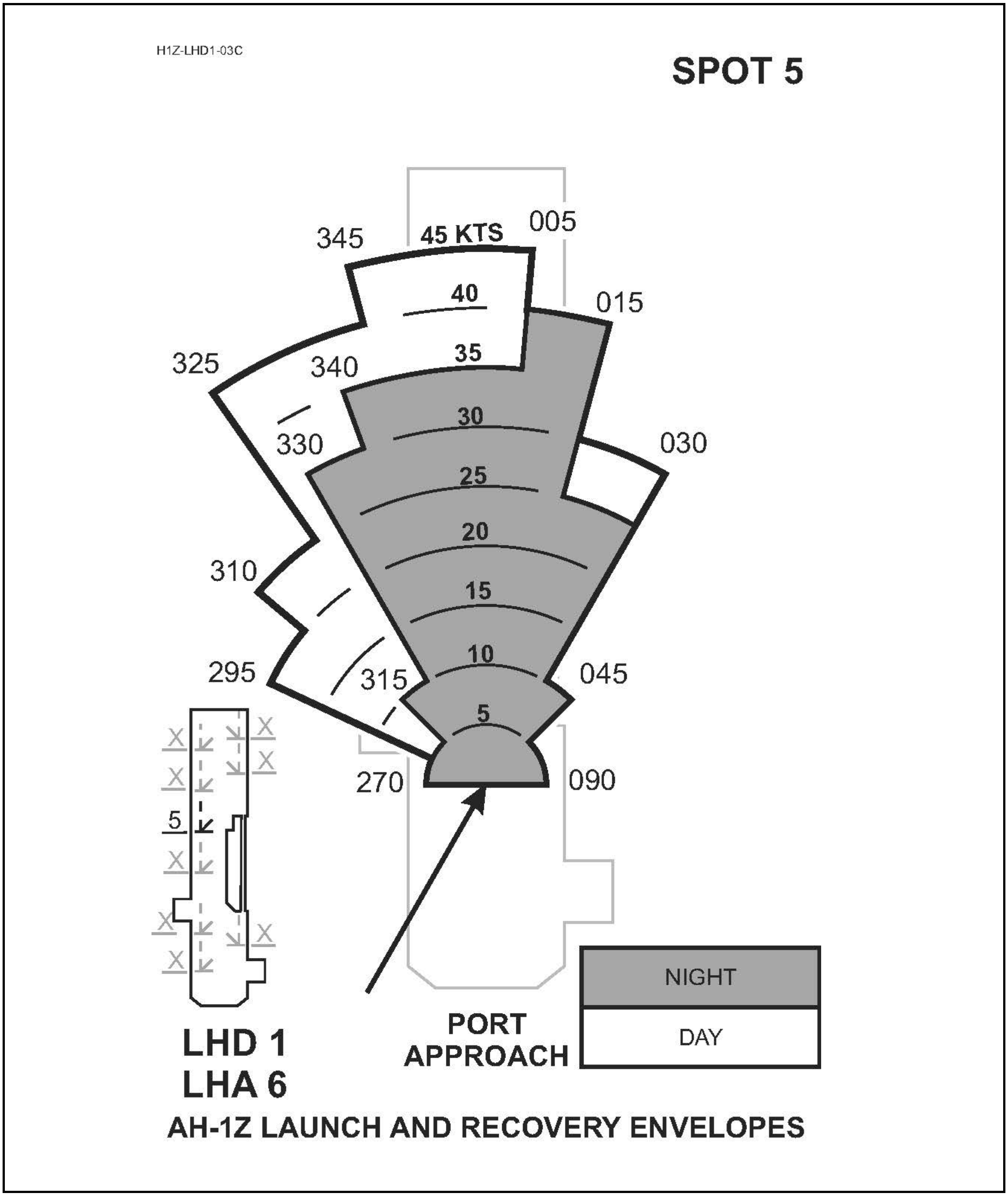


Figure A-13. AH-1Z Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spot 6

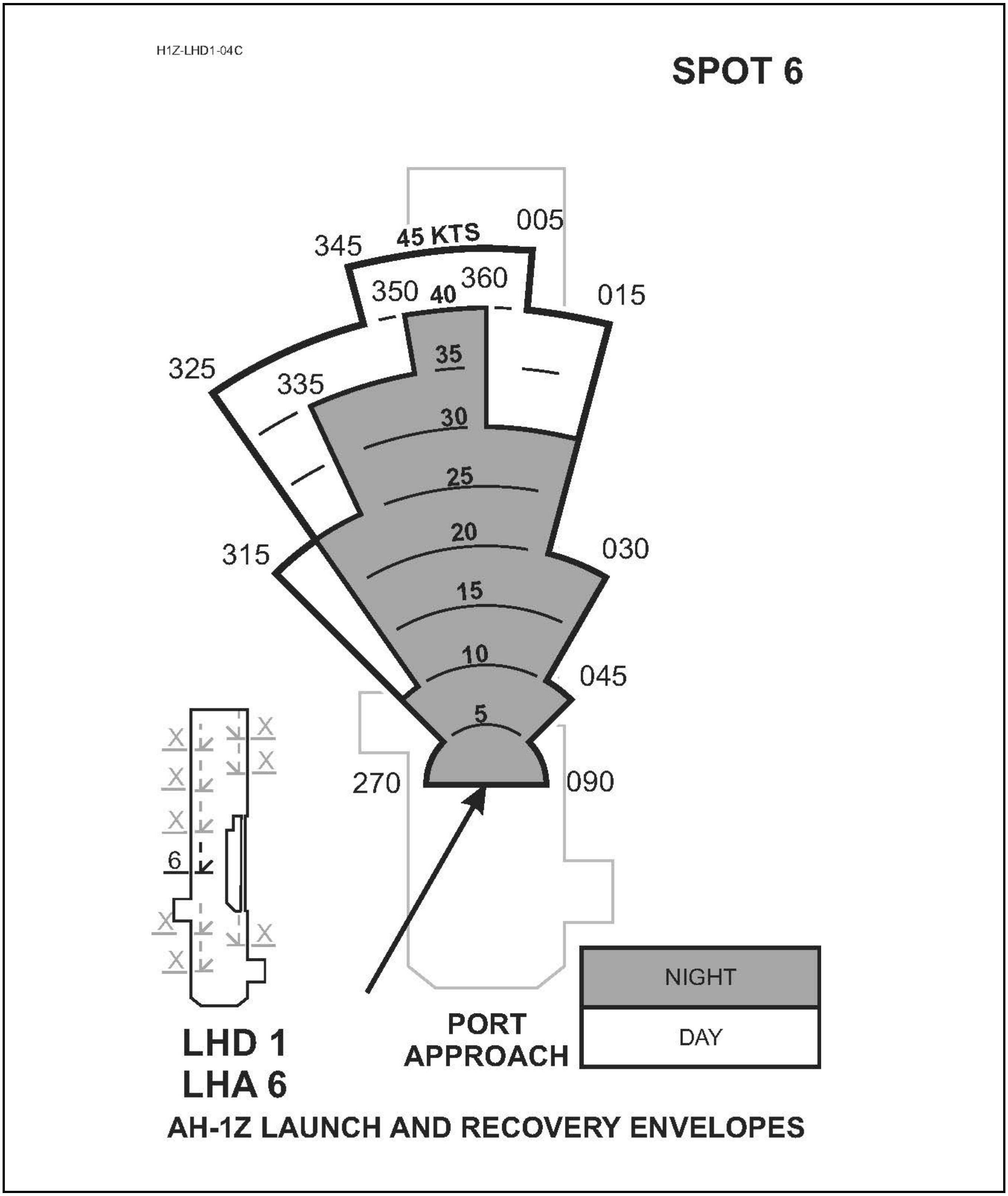


Figure A-14. UH-1Y Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spot 2

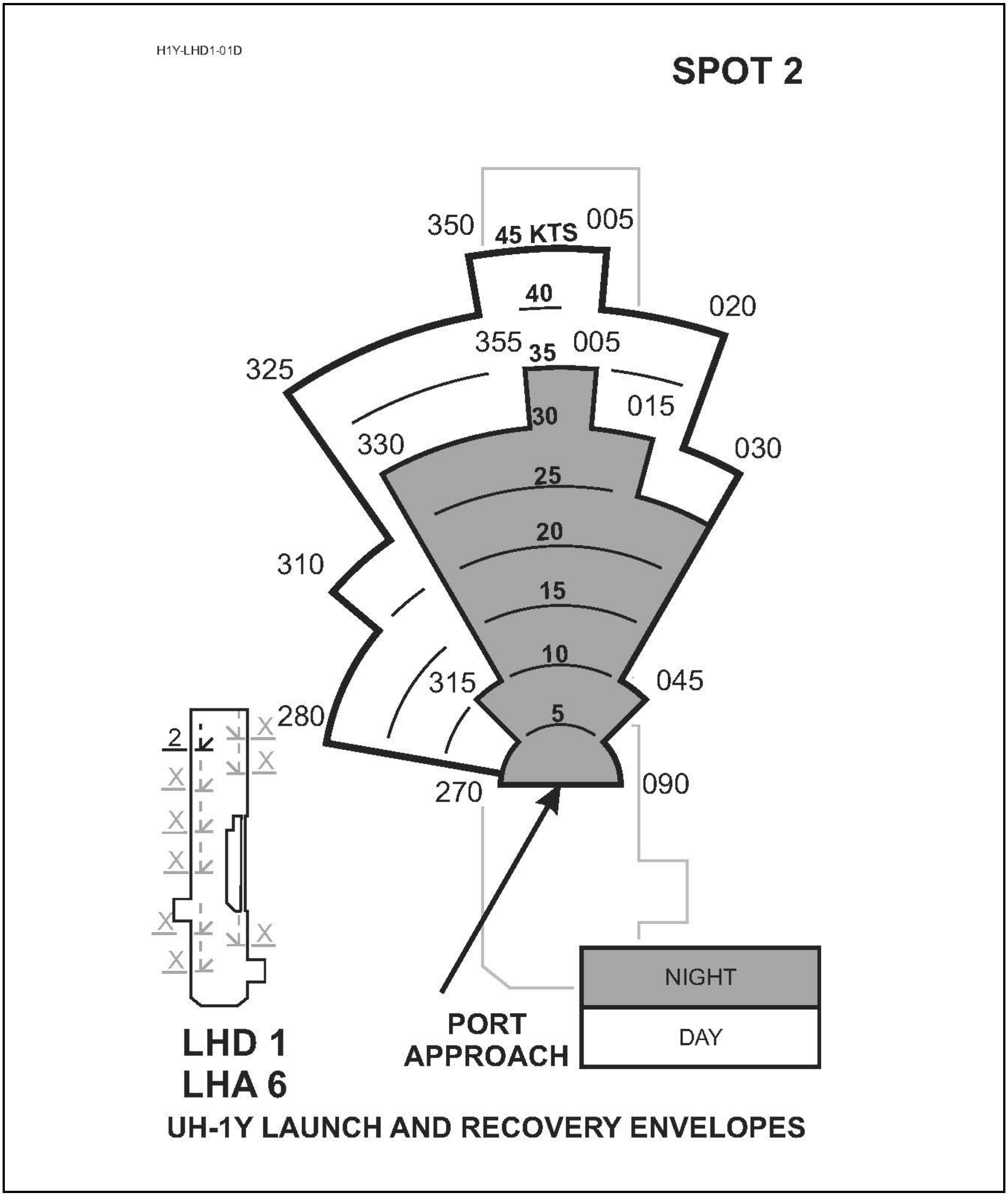


Figure A-15. UH-1Y Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spot 4

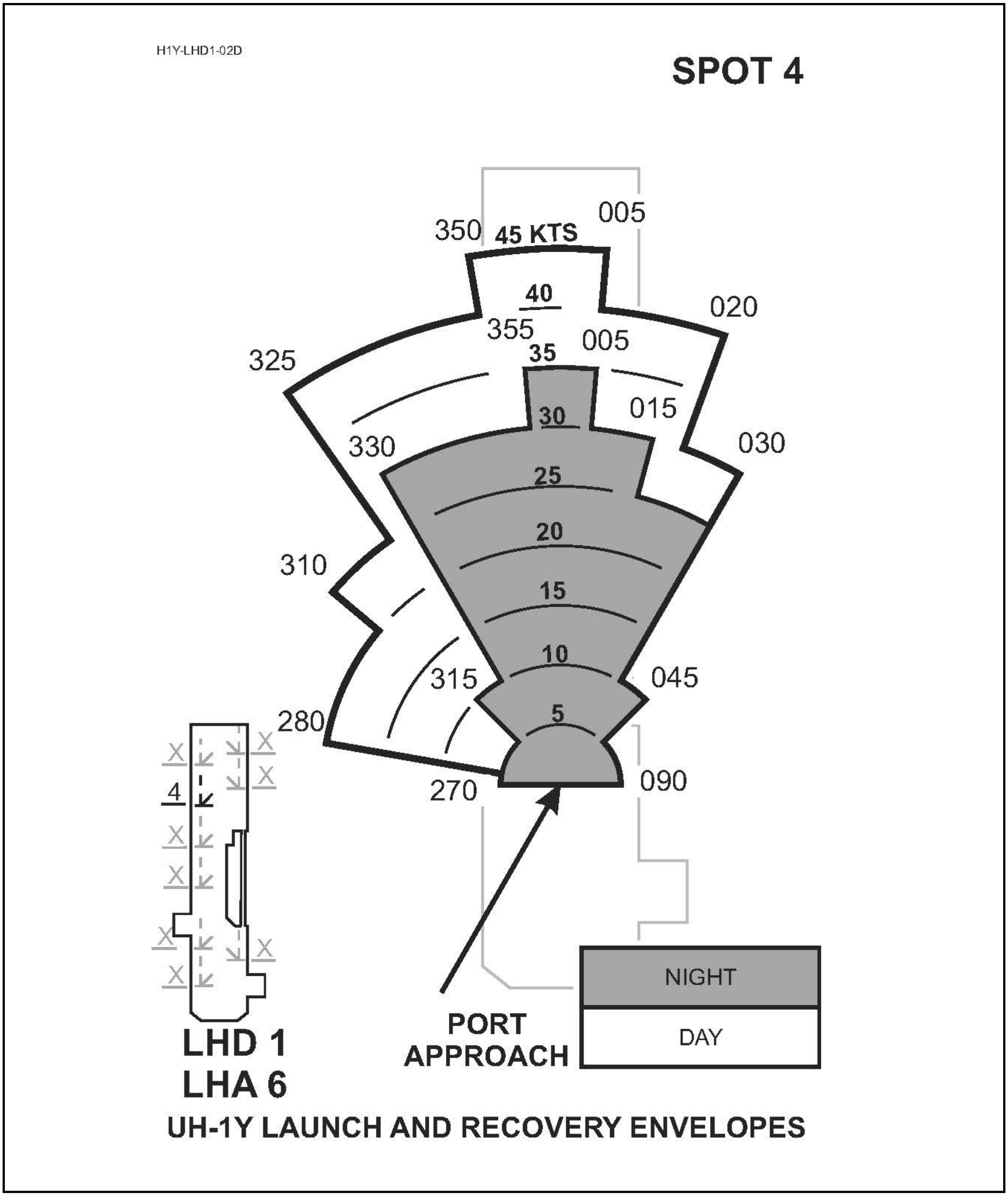


Figure A-16. UH-1Y Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spot 5

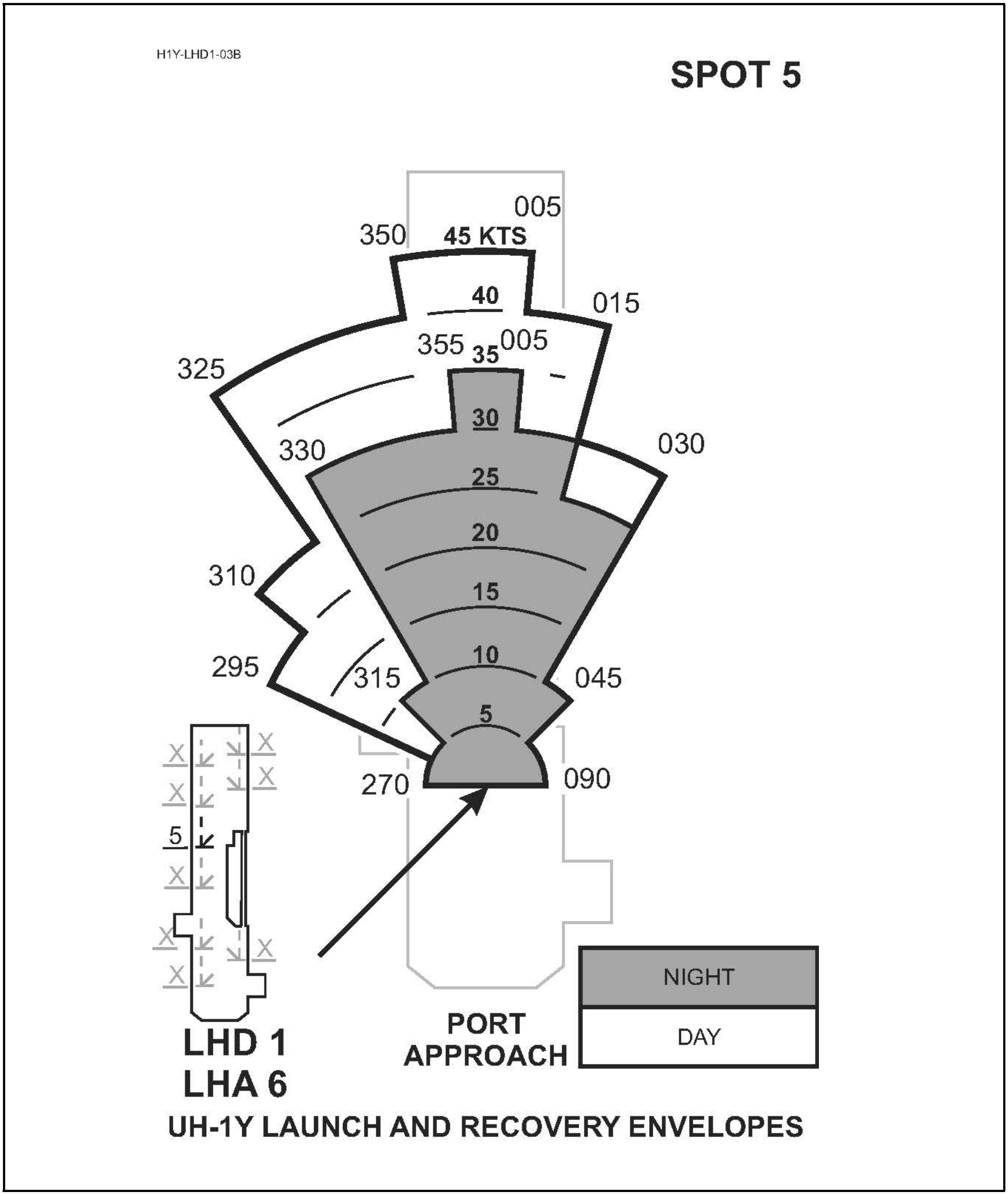


Figure A-17. UH-1Y Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spot 6

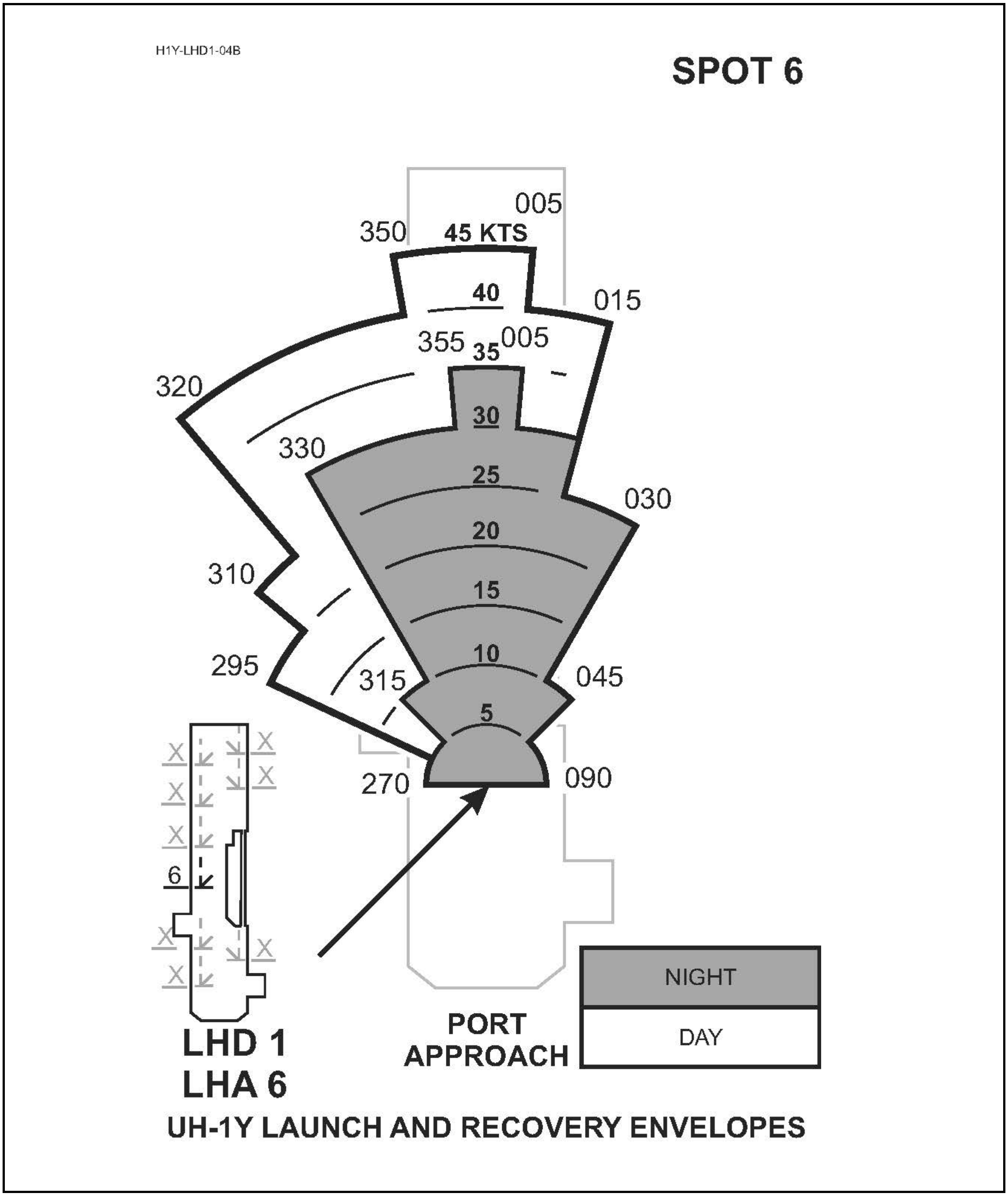


Figure A-18. H-53E Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spots 1 thru 4, 8

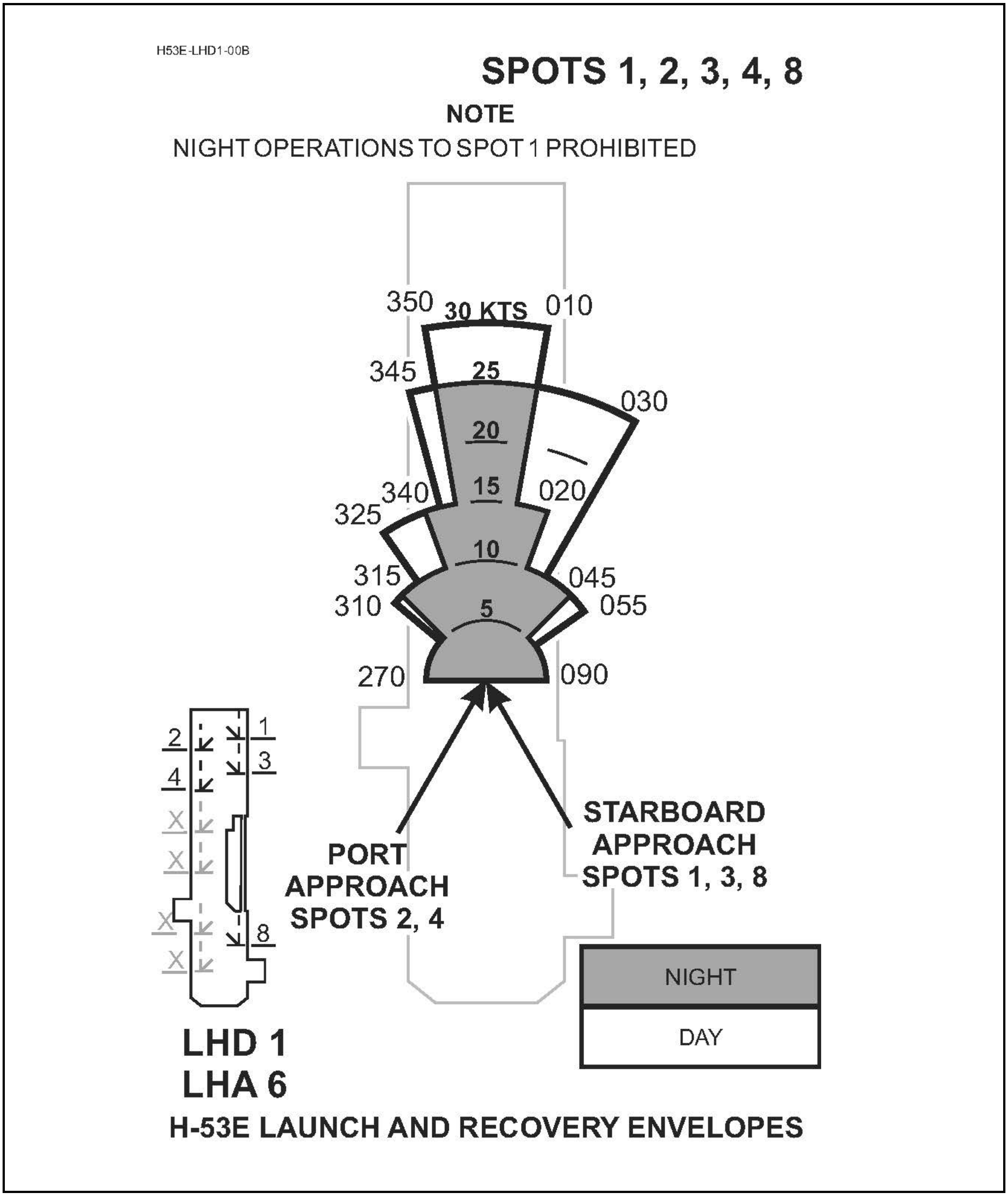


Figure A-19. H-53E Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spot 5

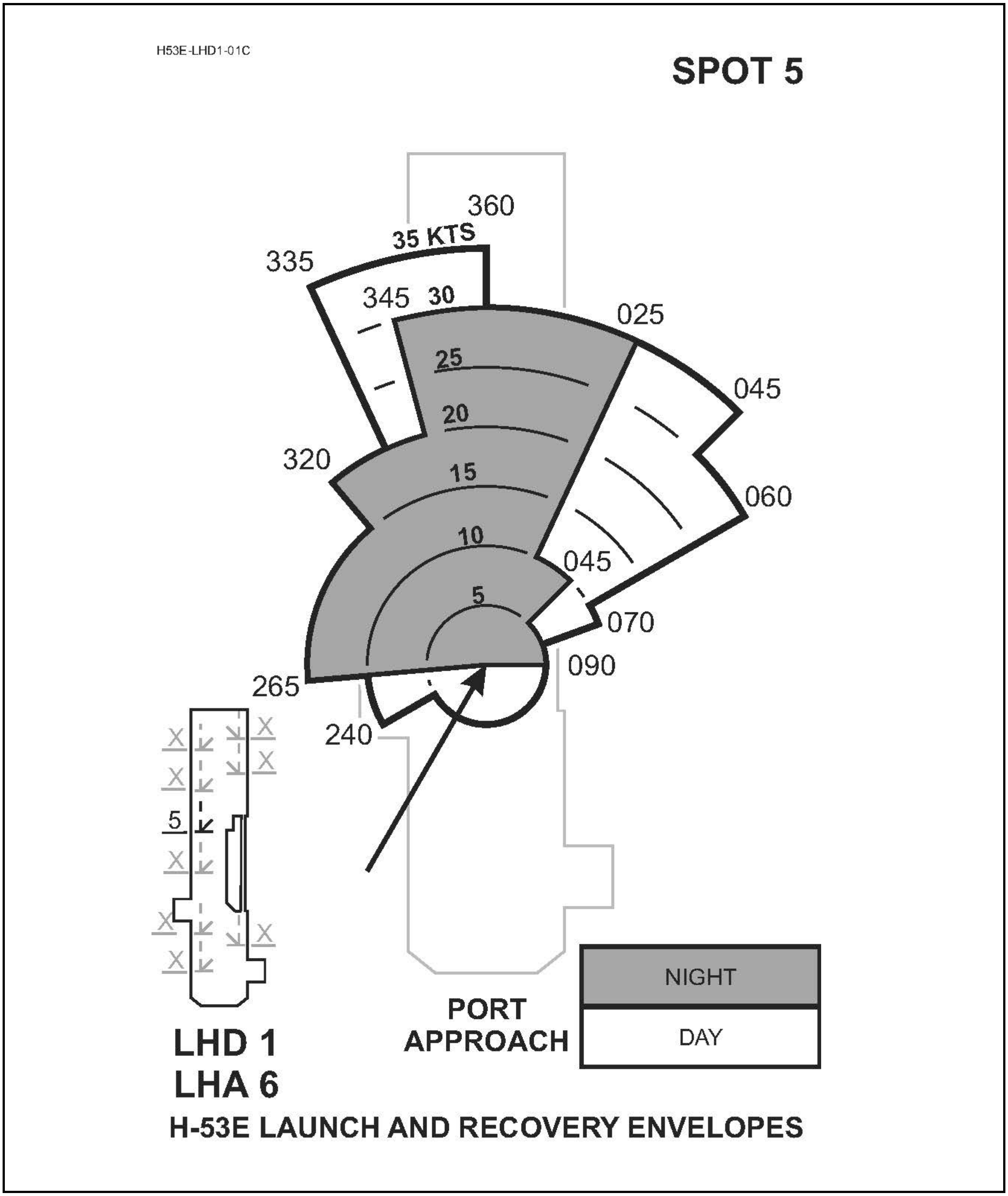


Figure A-20. H-53E Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spot 6

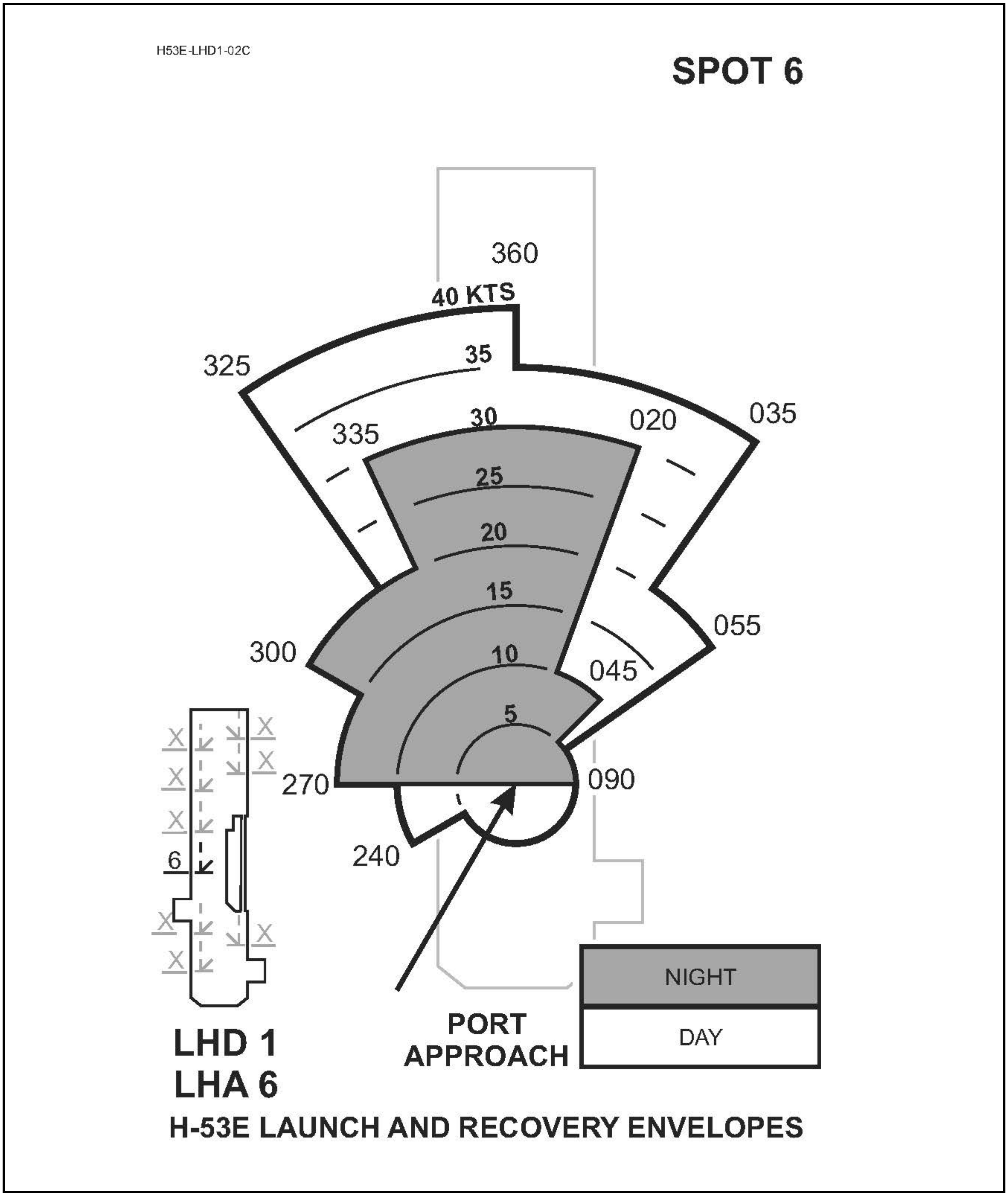


Figure A-21. H-53E Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spot 7

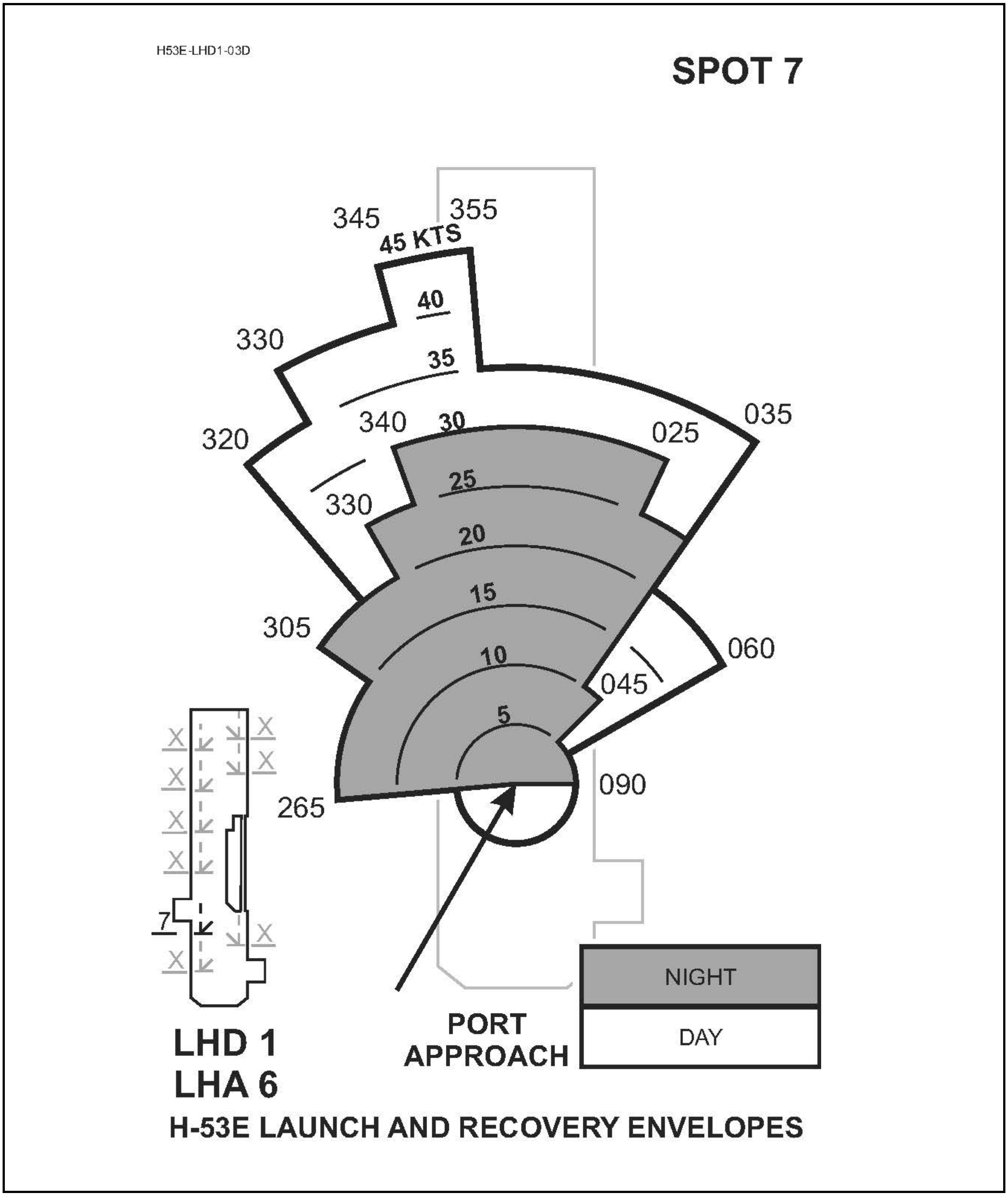


Figure A-22. H-53E Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spot 9

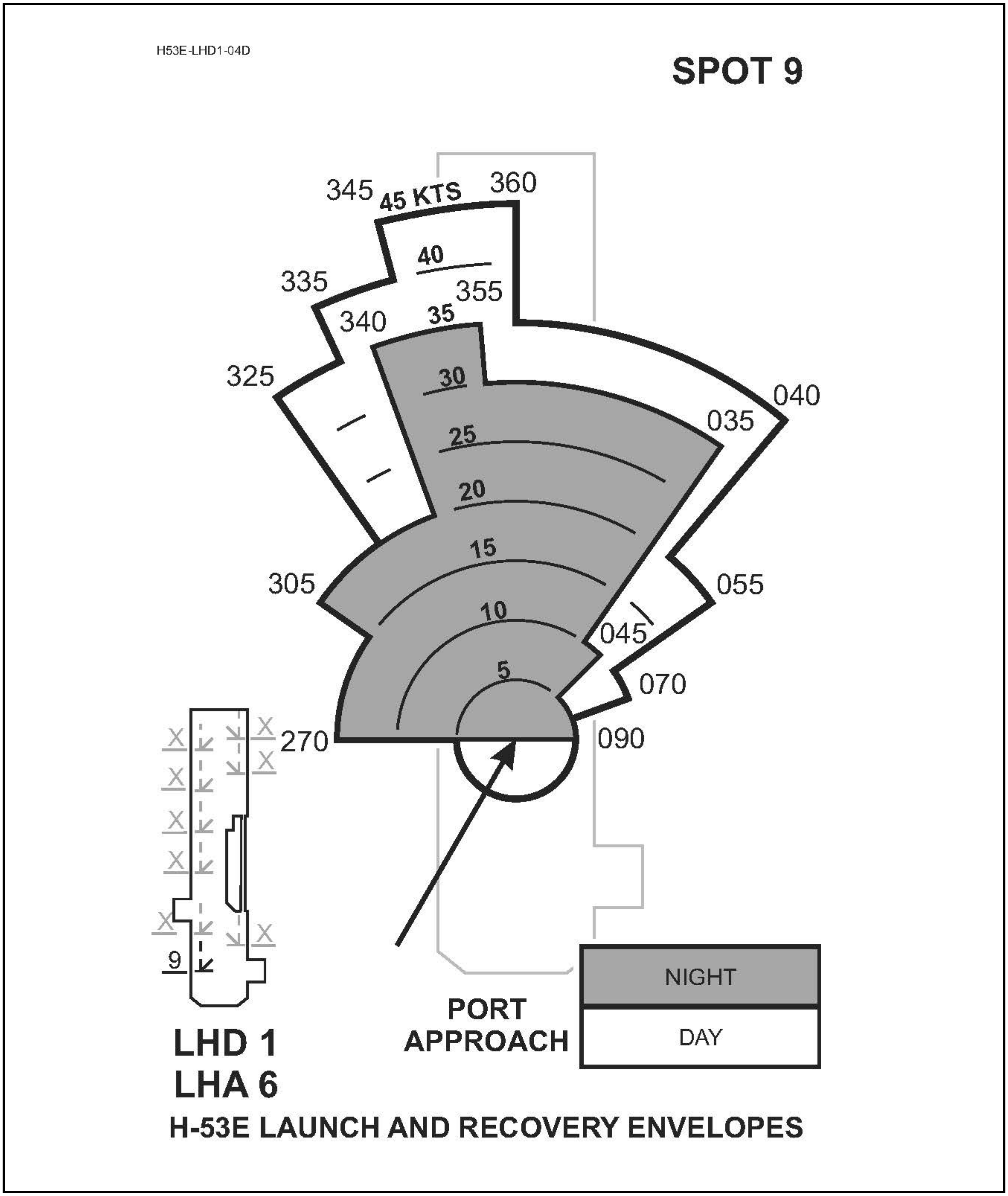


Figure A-23. H-60A/B/F/G/H/J/K/L/M/Q/R/S Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spot 2

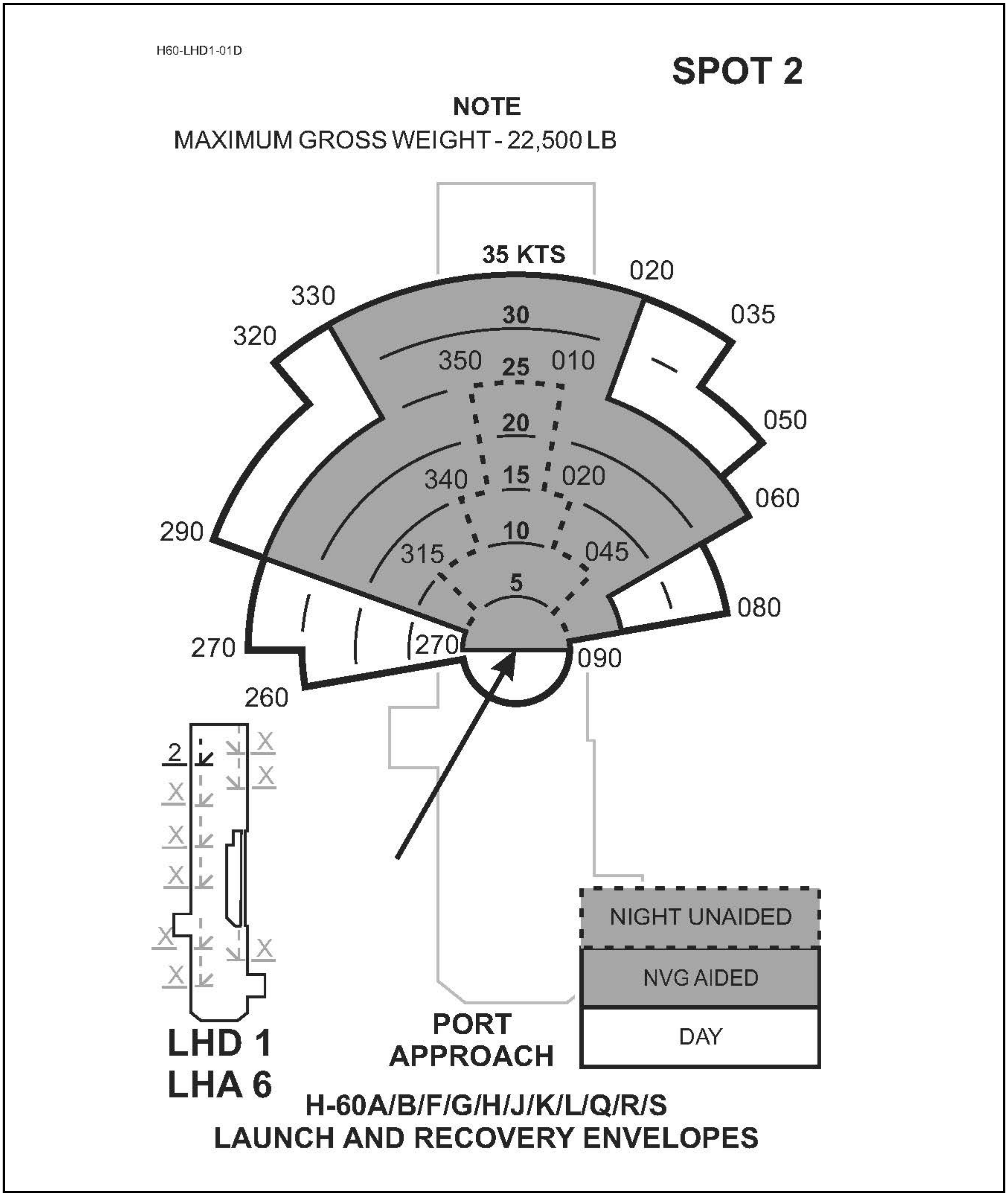


Figure A-24. H-60A/B/F/G/H/J/K/L/M/Q/R/S Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spot 4

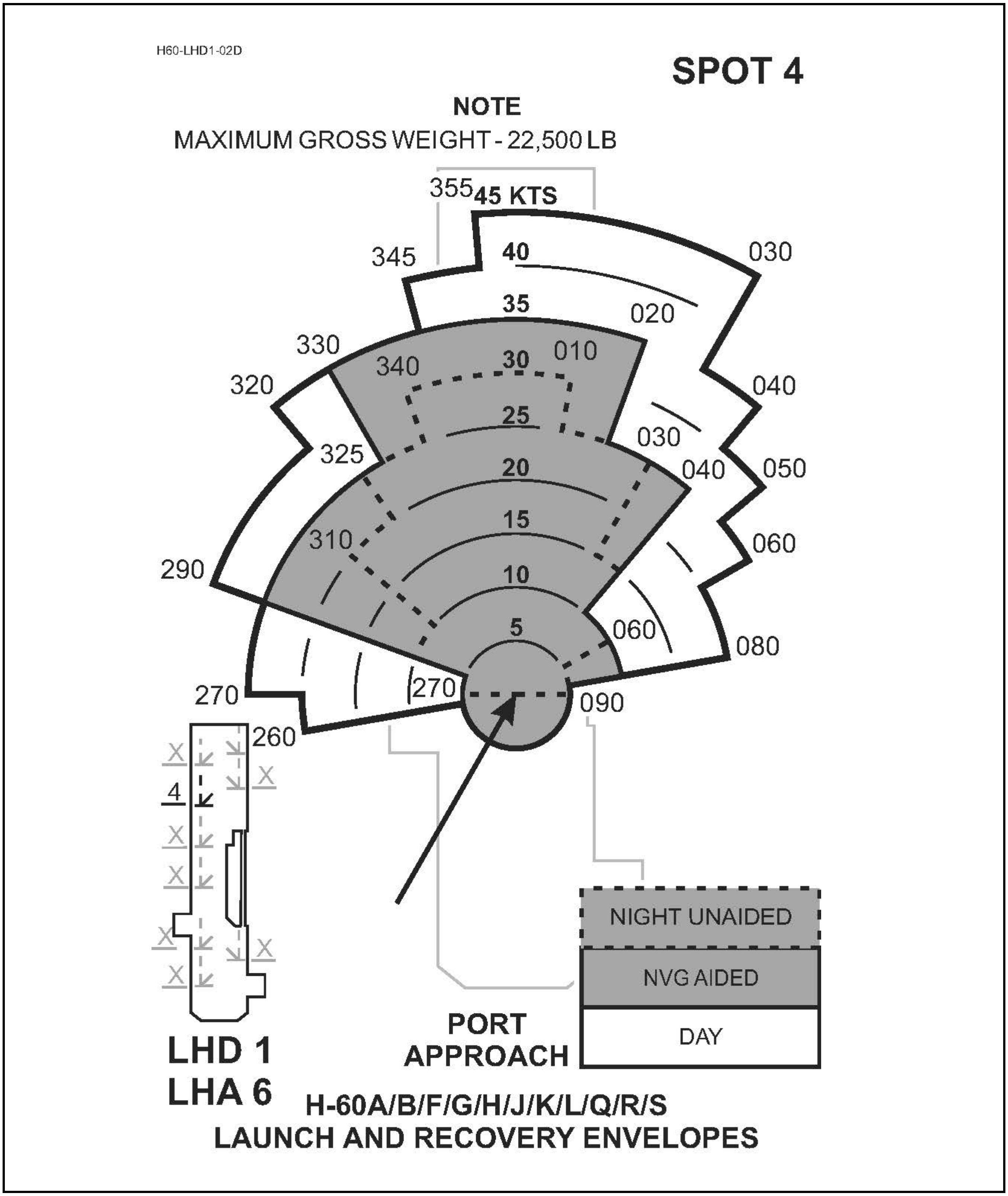


Figure A-25. H-60A/B/F/G/H/J/K/L/M/Q/R/S Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spot 5

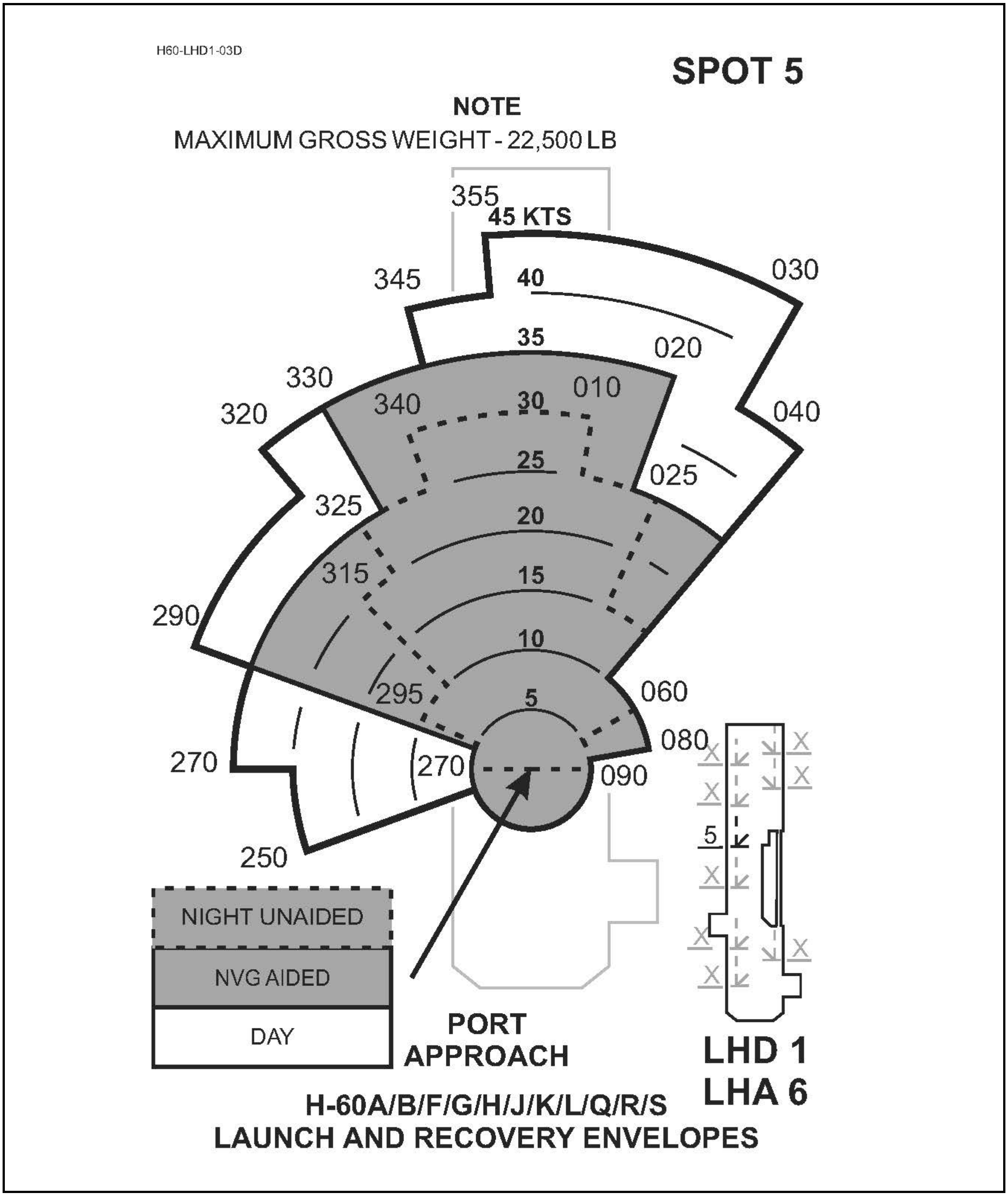


Figure A-26. H-60A/B/F/G/H/J/K/L/M/Q/R/S Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spot 6

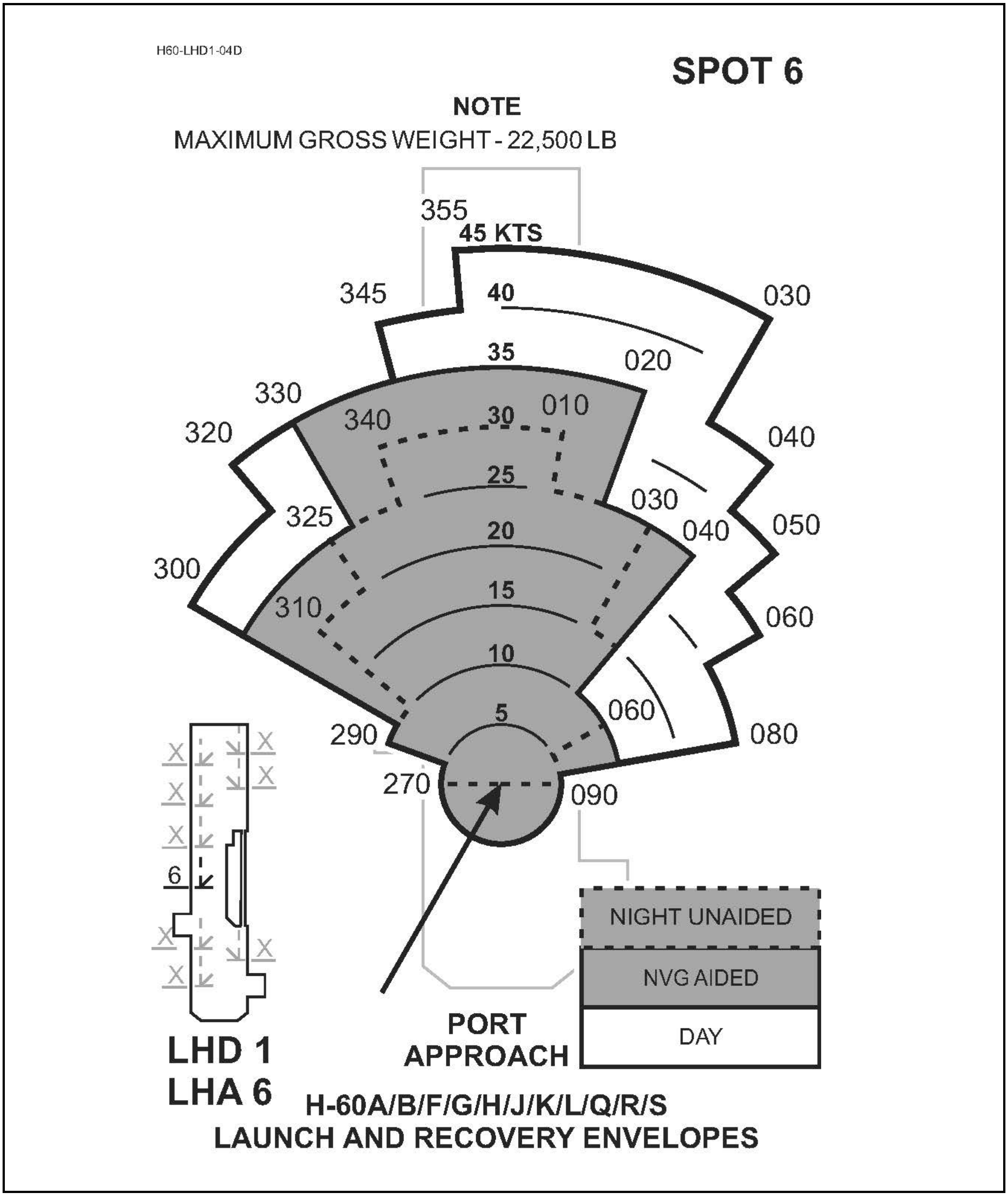


Figure A-27. H-60A/B/F/G/H/J/K/L/M/Q/R/S Unaided Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spot 7

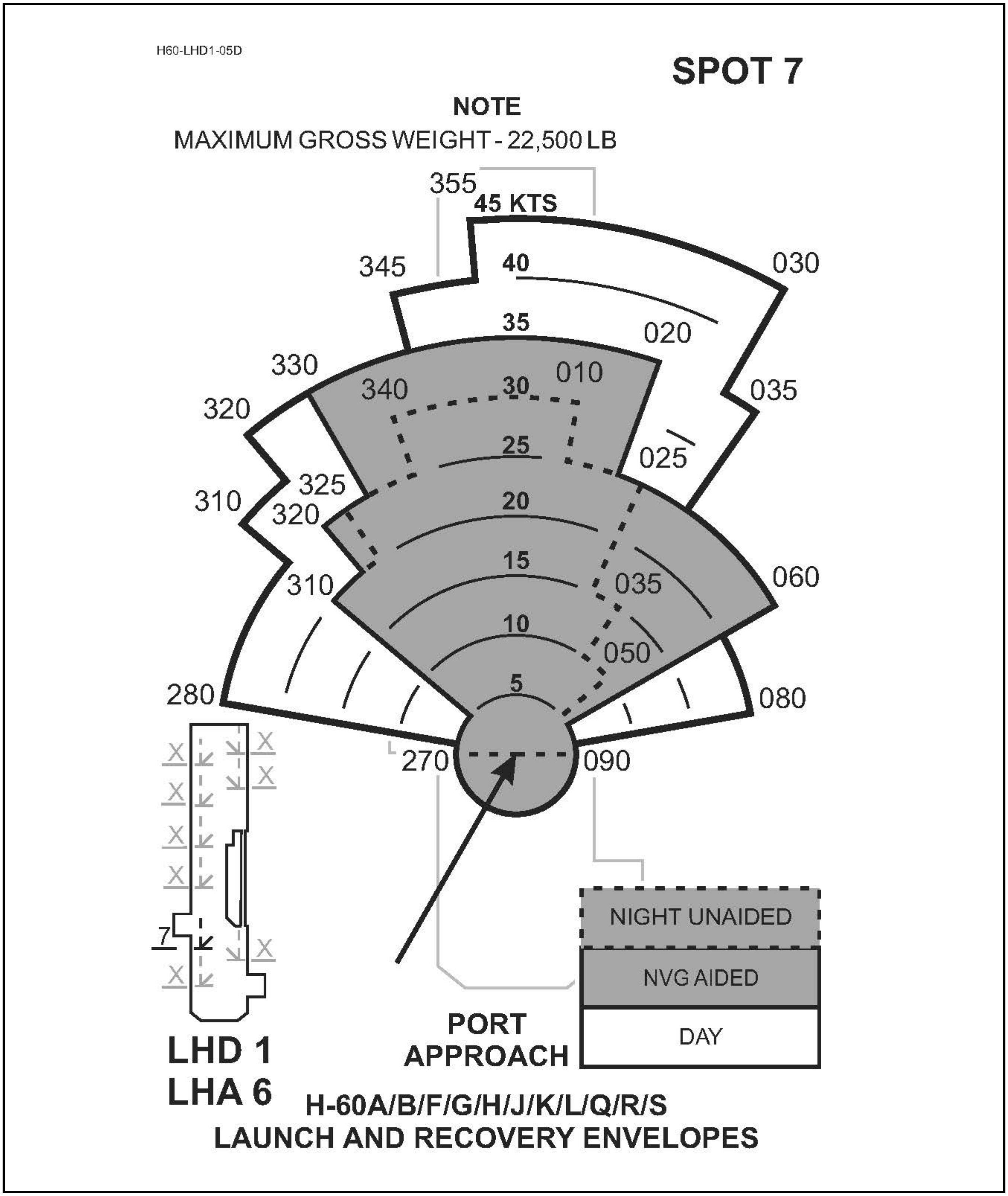


Figure A-28. H-60A/B/F/G/H/J/K/L/M/Q/R/S Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spot 8

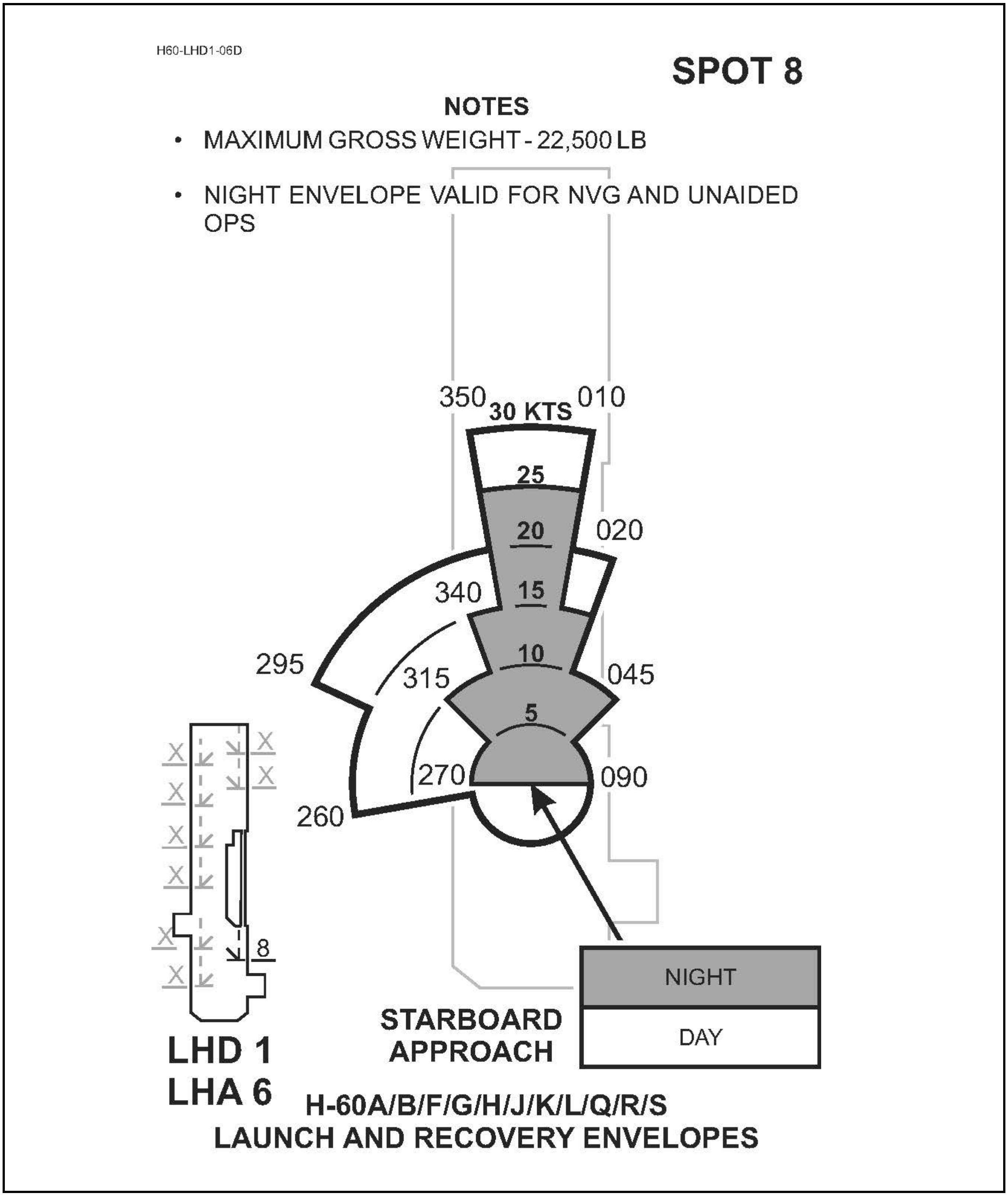


Figure A-29. V-22 Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spot 2 (Sheet 1 of 2)

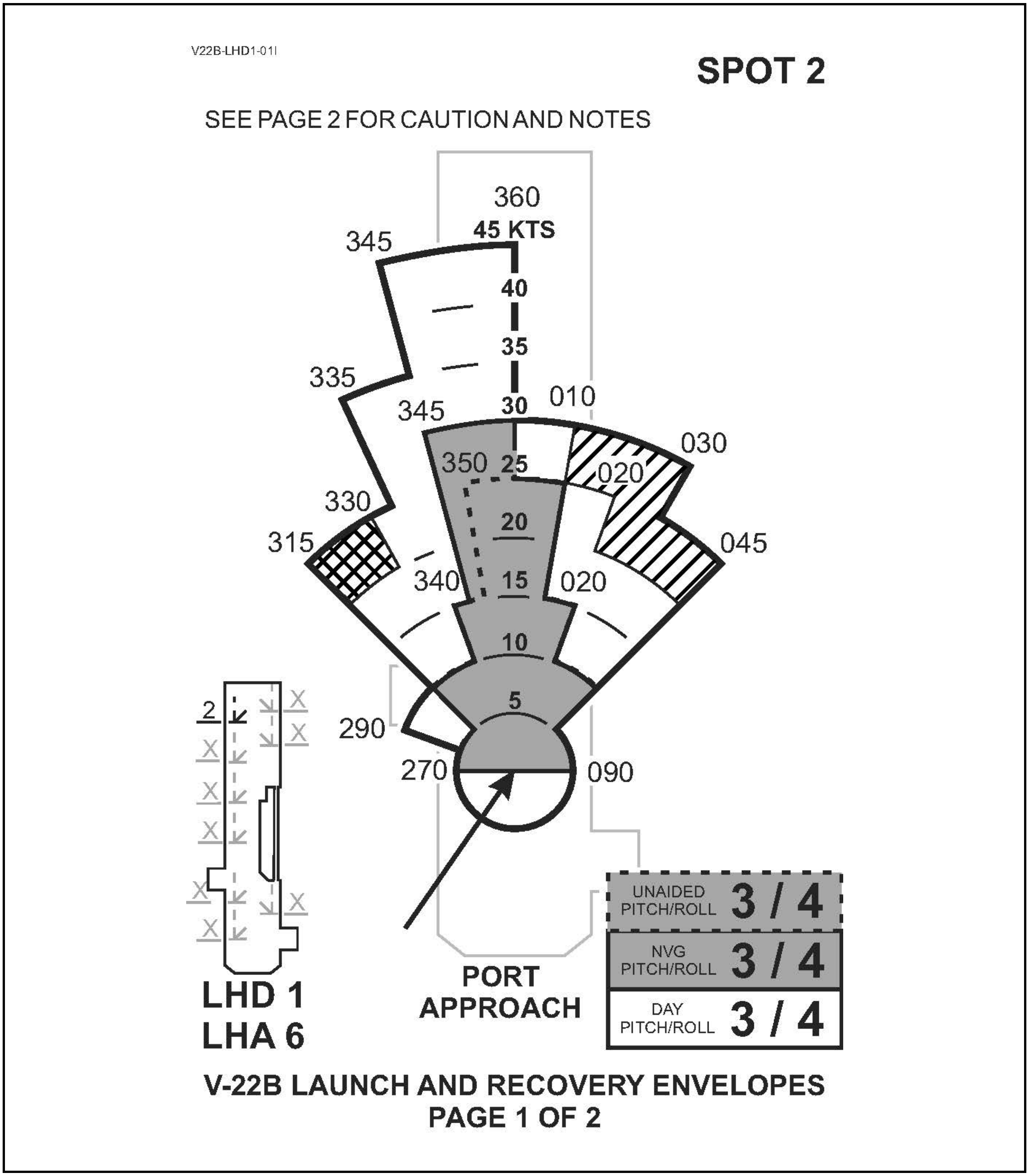


Figure A-29. V-22 Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spot 2 (Sheet 2)

V22B-LHD1-01I

# SPOT 2

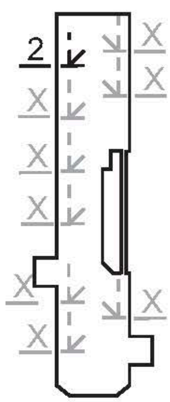
**CAUTION**

FLIGHT OPERATION IN HATCHED AREA MAY REQUIRE ALTERNATE APPROACH TECHNIQUE (B) DUE TO POTENTIAL FOR PITCH-UP WITH SIDESLIP. PRIOR TO LIFT OFF, CENTER STICK LONGITUDINALLY AND SET NACELLE ANGLE 90 ± 2 DEGREES.

FLIGHT OPERATION IN CROSSHATCHED AREA MAY REQUIRE ALTERNATE APPROACH TECHNIQUE (A) DUE TO POTENTIAL FOR PITCH-UP WITH SIDESLIP.

**NOTES**

- LEFT SEAT NIGHT OPERATIONS PROHIBITED.




**LHD 1**
**LHA 6**

**V-22B LAUNCH AND RECOVERY ENVELOPES**
**PAGE 2 OF 2**

Figure A-30. V-22 Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spot 4 (Sheet 1 of 2)

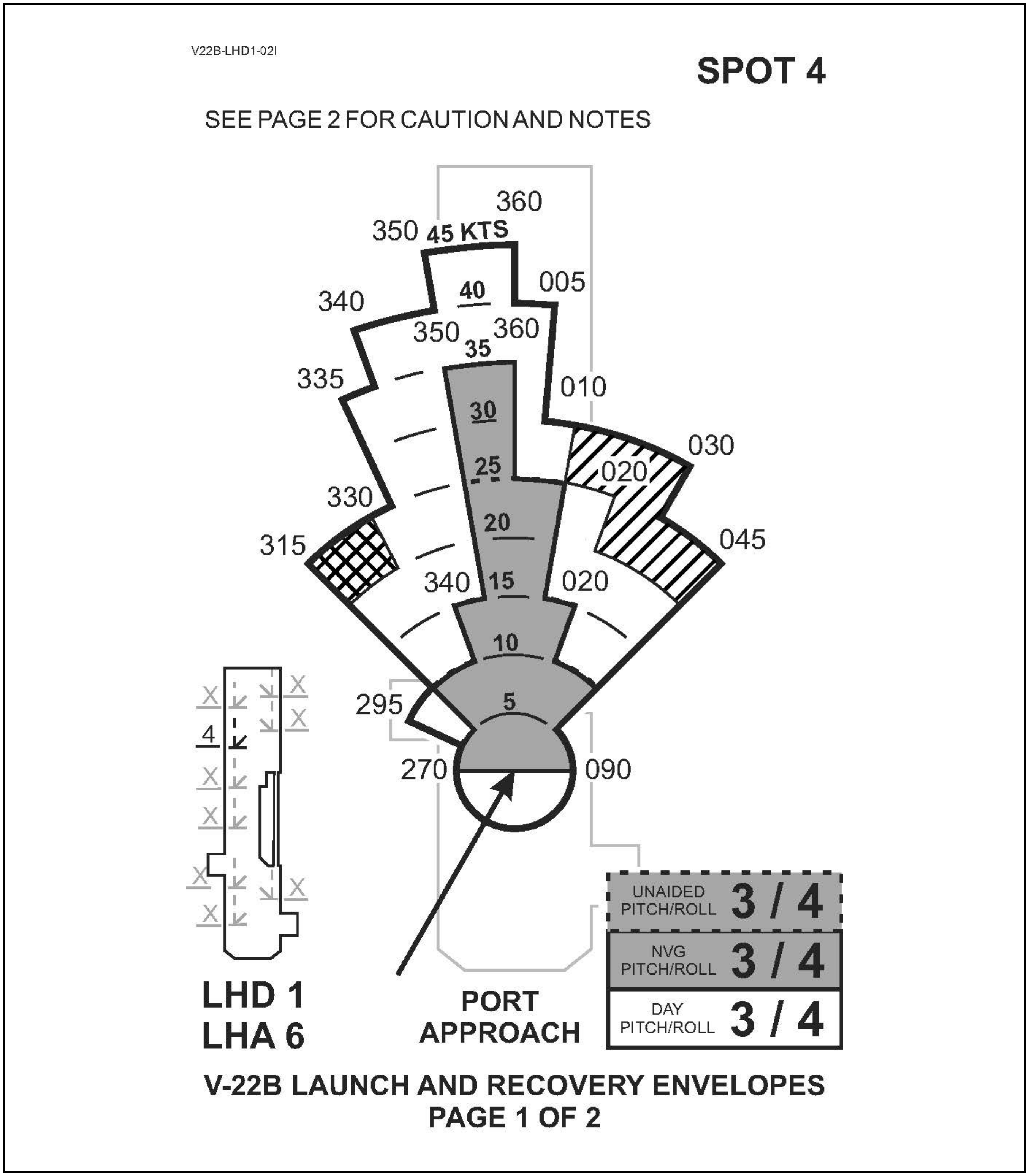


Figure A-30. V-22 Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spot 4 (Sheet 2)

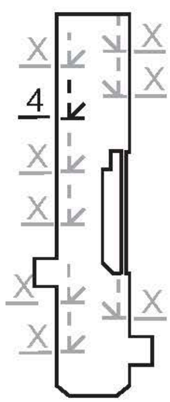
V22B-LHD1-02I

## SPOT 4

**CAUTION**

FLIGHT OPERATION IN HATCHED AREA MAY REQUIRE ALTERNATE APPROACH TECHNIQUE (B) DUE TO POTENTIAL FOR PITCH-UP WITH SIDESLIP. PRIOR TO LIFT OFF, CENTER STICK LONGITUDINALLY AND SET NACELLE ANGLE 90 ± 2 DEGREES.

FLIGHT OPERATION IN CROSSHATCHED AREA MAY REQUIRE ALTERNATE APPROACH TECHNIQUE (A) DUE TO POTENTIAL FOR PITCH-UP WITH SIDESLIP.




**LHD 1**
**LHA 6**

**V-22B LAUNCH AND RECOVERY ENVELOPES**
**PAGE 2 OF 2**

Figure A-31. V-22 Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spot 5

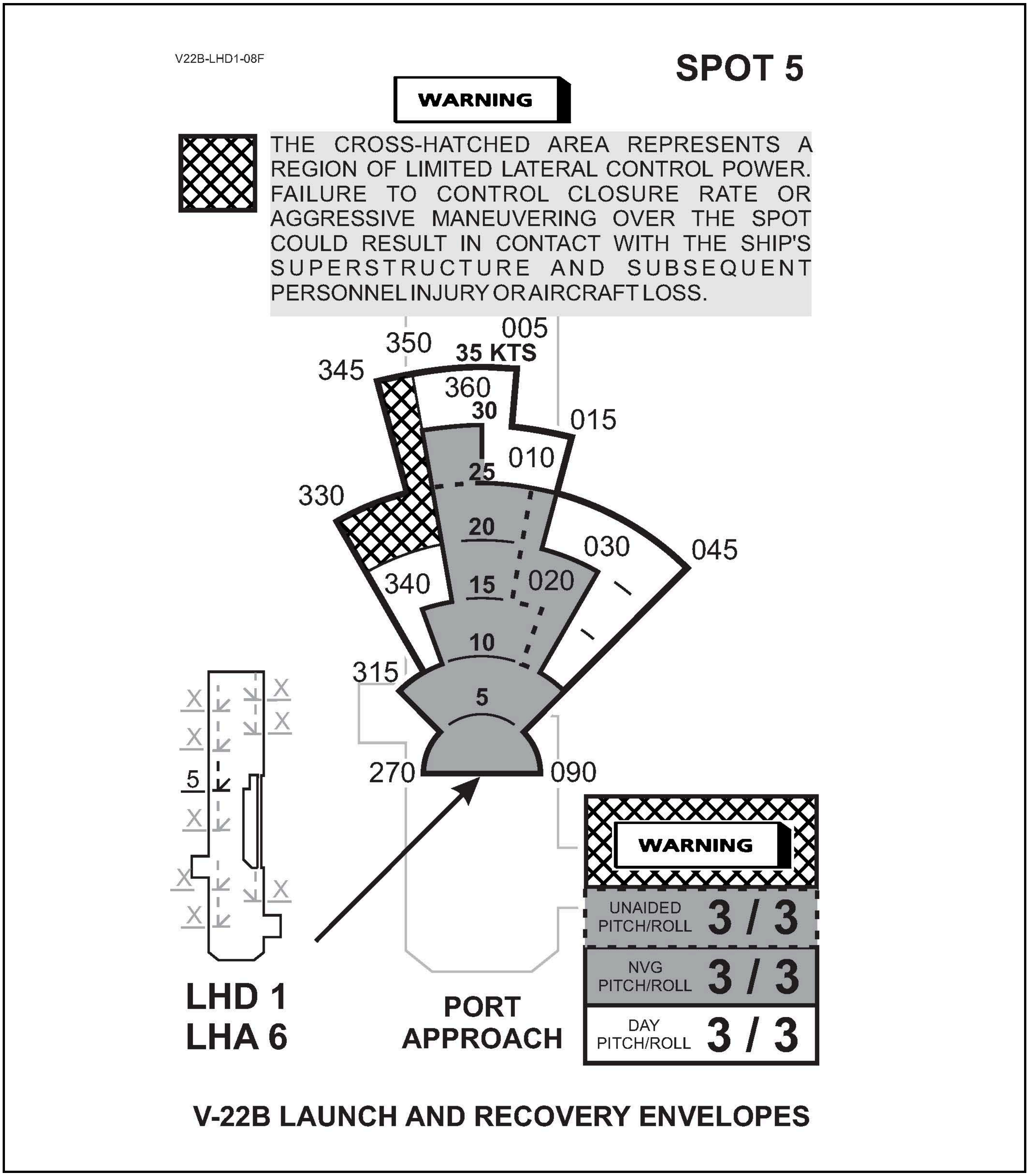


Figure A-32. V-22 Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spot 6

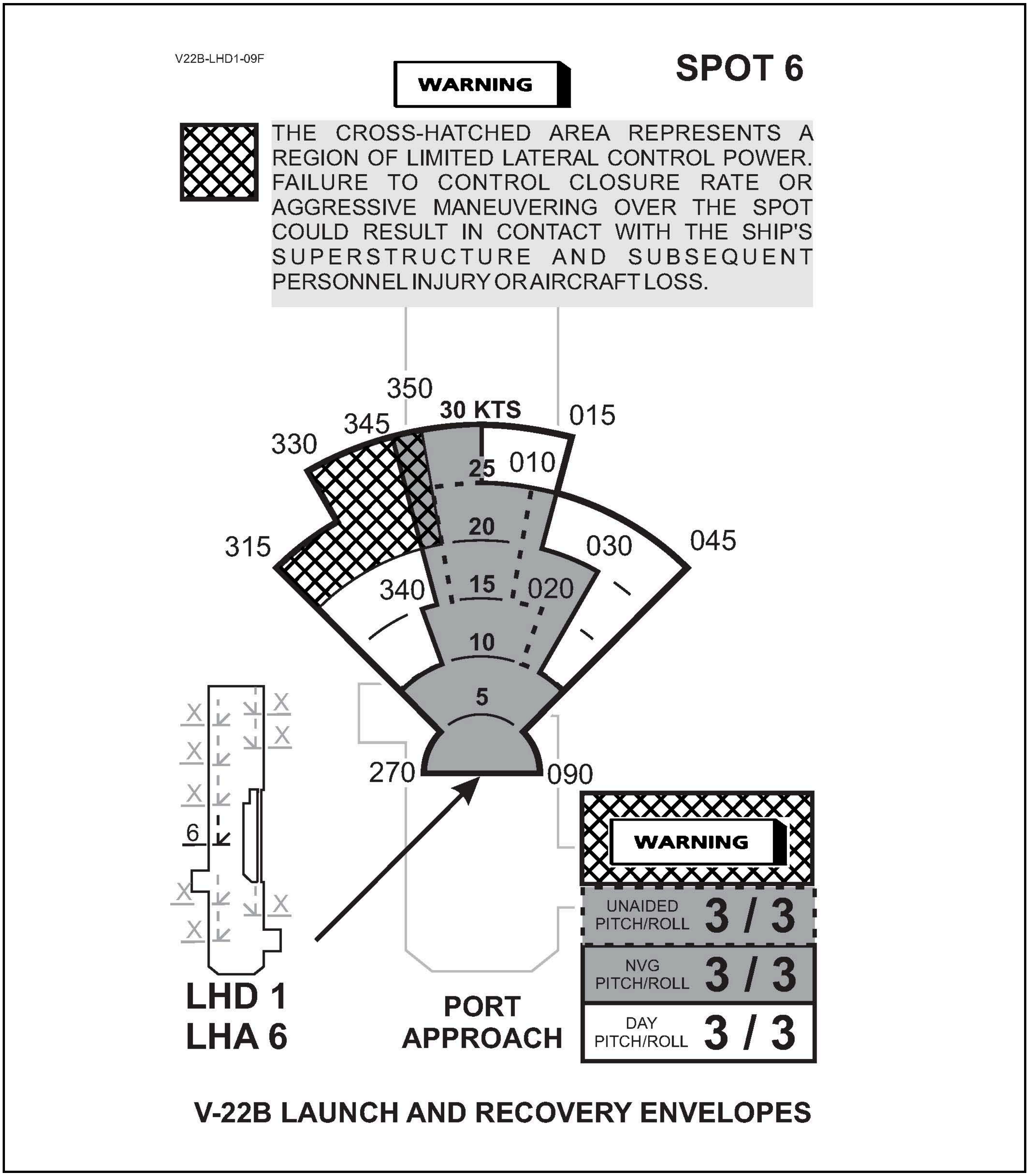


Figure A-33. V-22 Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spot 7

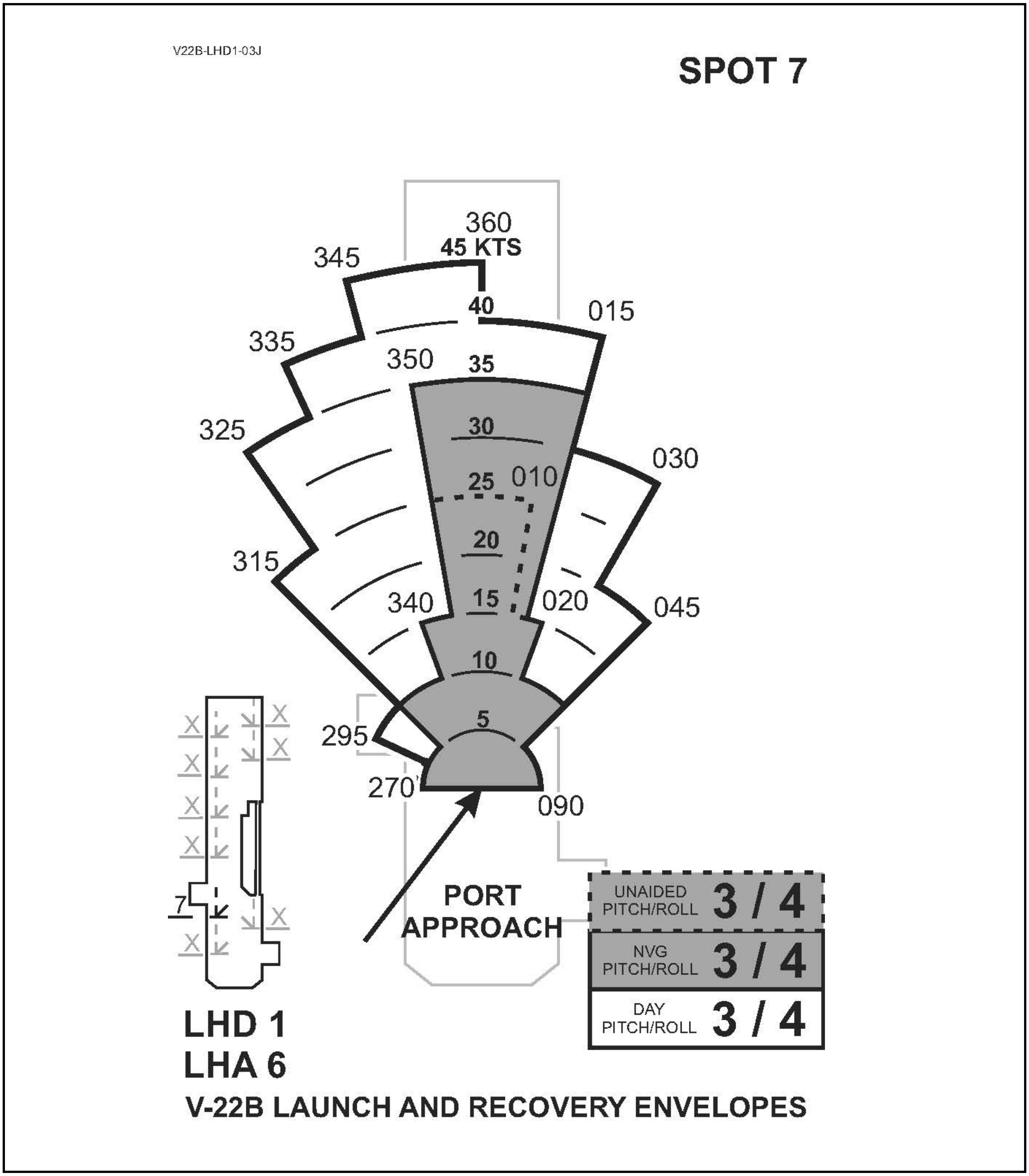


Figure A-34. V-22 Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spot 9

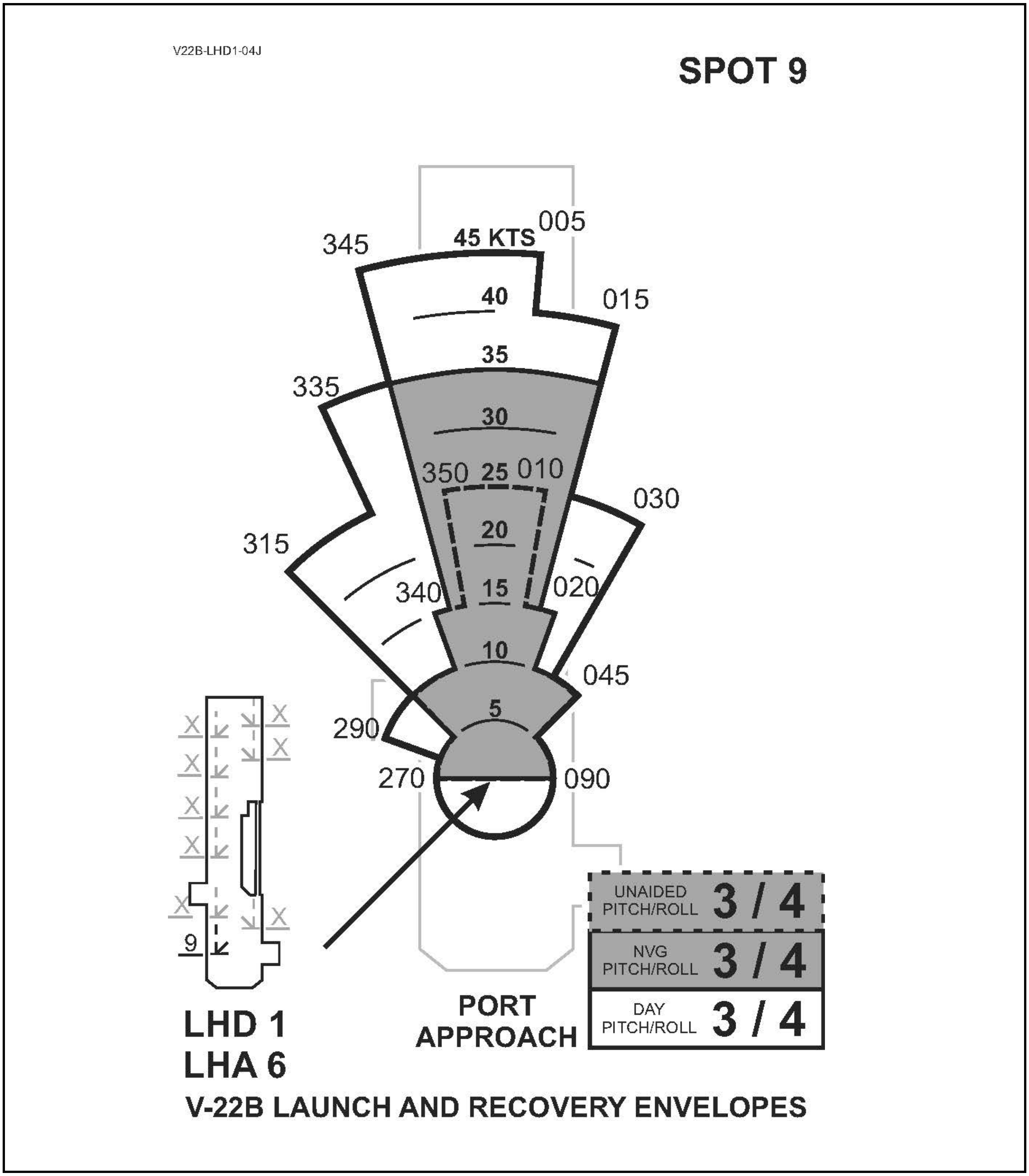


Figure A-35. V-22 Launch/Recovery Envelopes — LHD and LHA-6 Type Ships — Spot 3 and 8

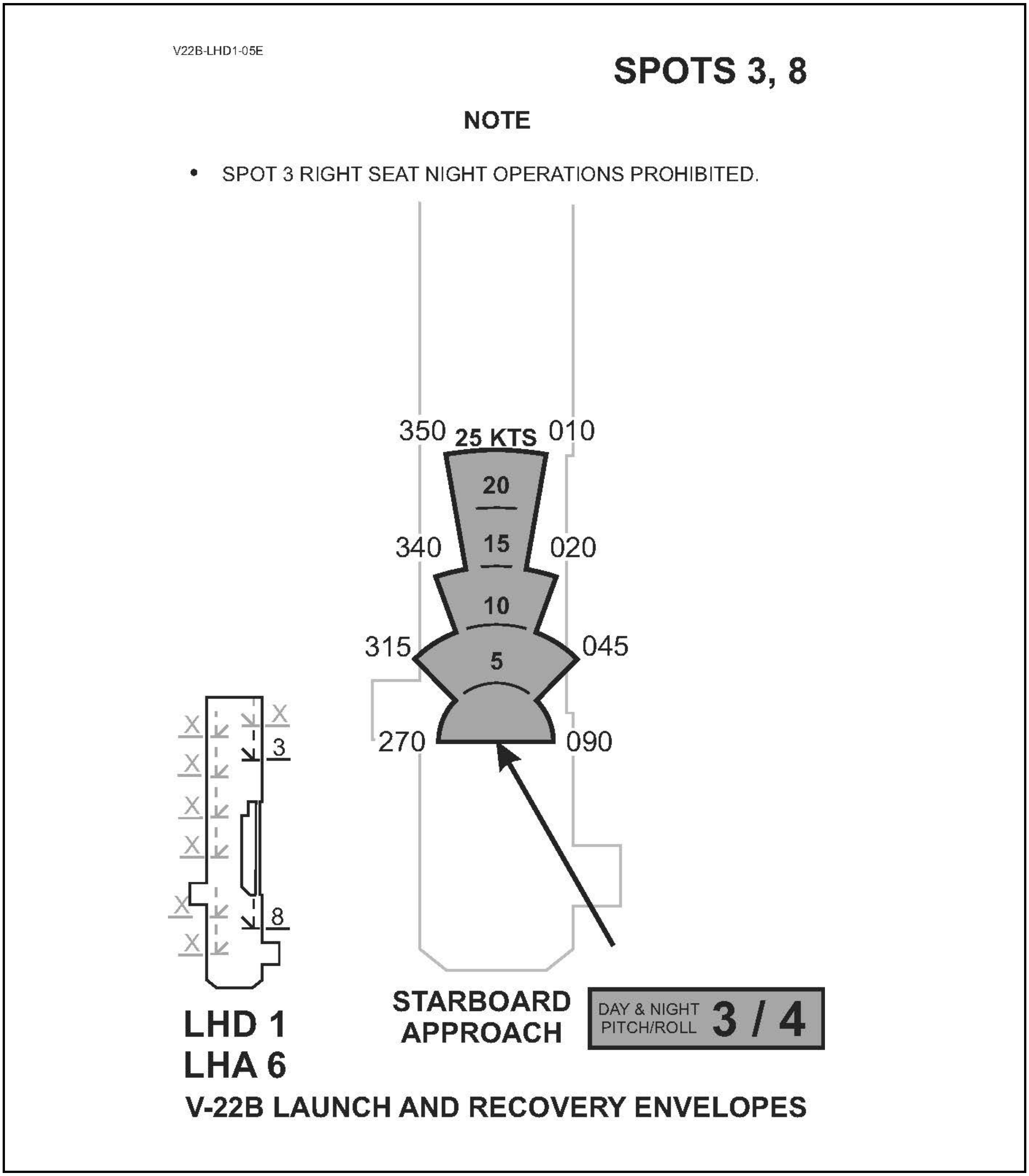


Figure A-36. V-22 Short Takeoff Envelopes — LHD and LHA-6 Type Ships — From Port Longitudinal Lineup Line

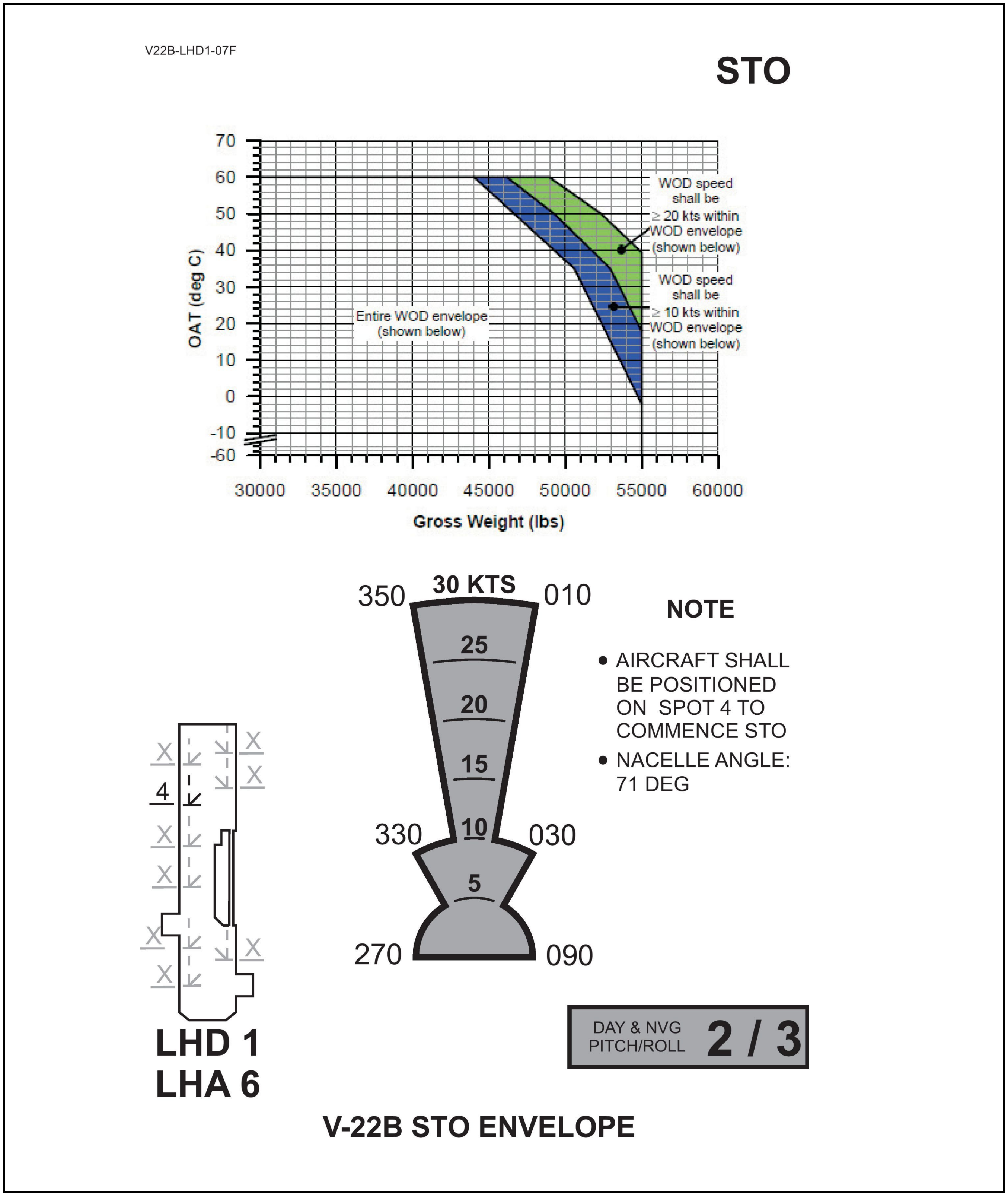


Figure A-37. AV-8B/TAV-8B STO Crosswind Limitations — LHD/LHA-6 Axial Deck

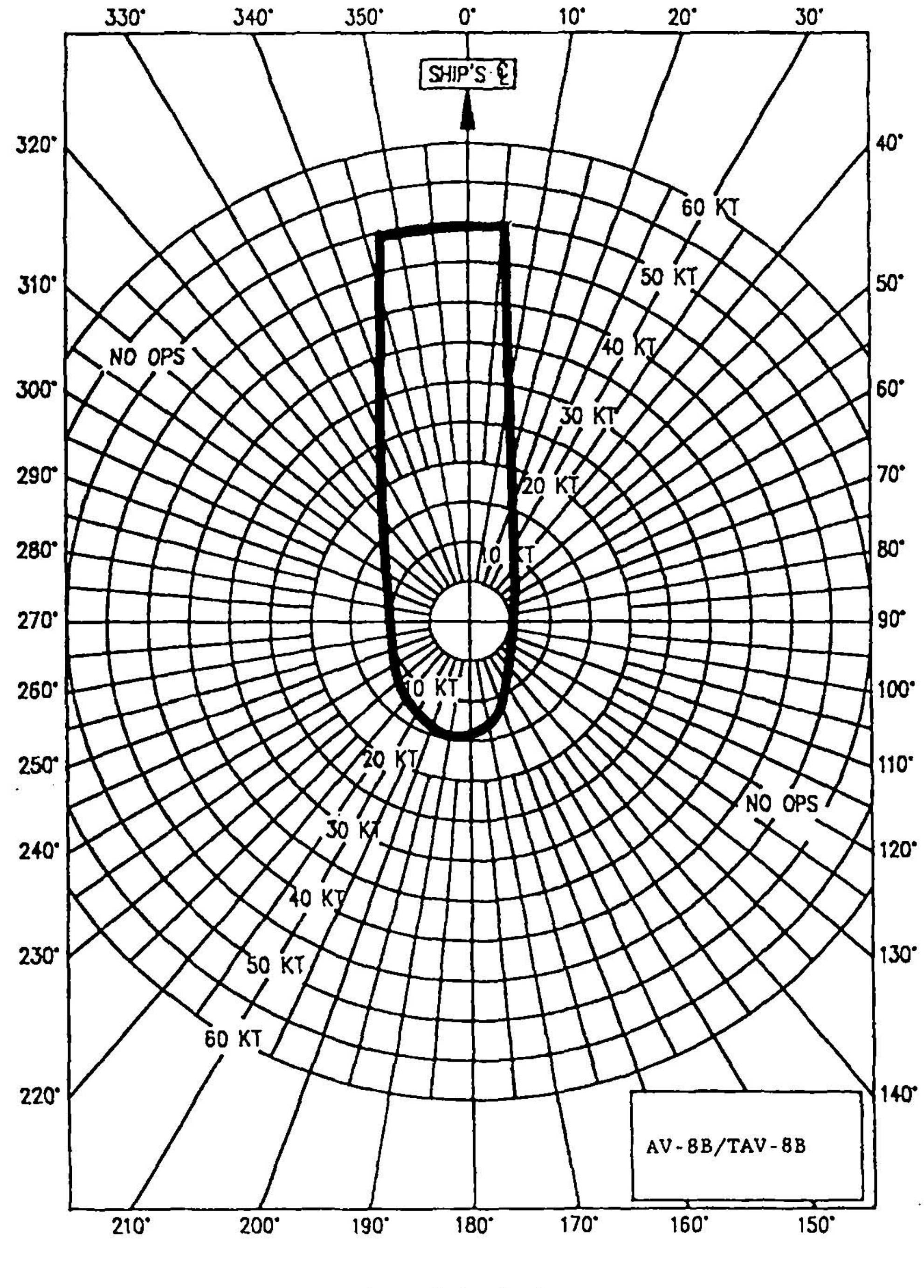
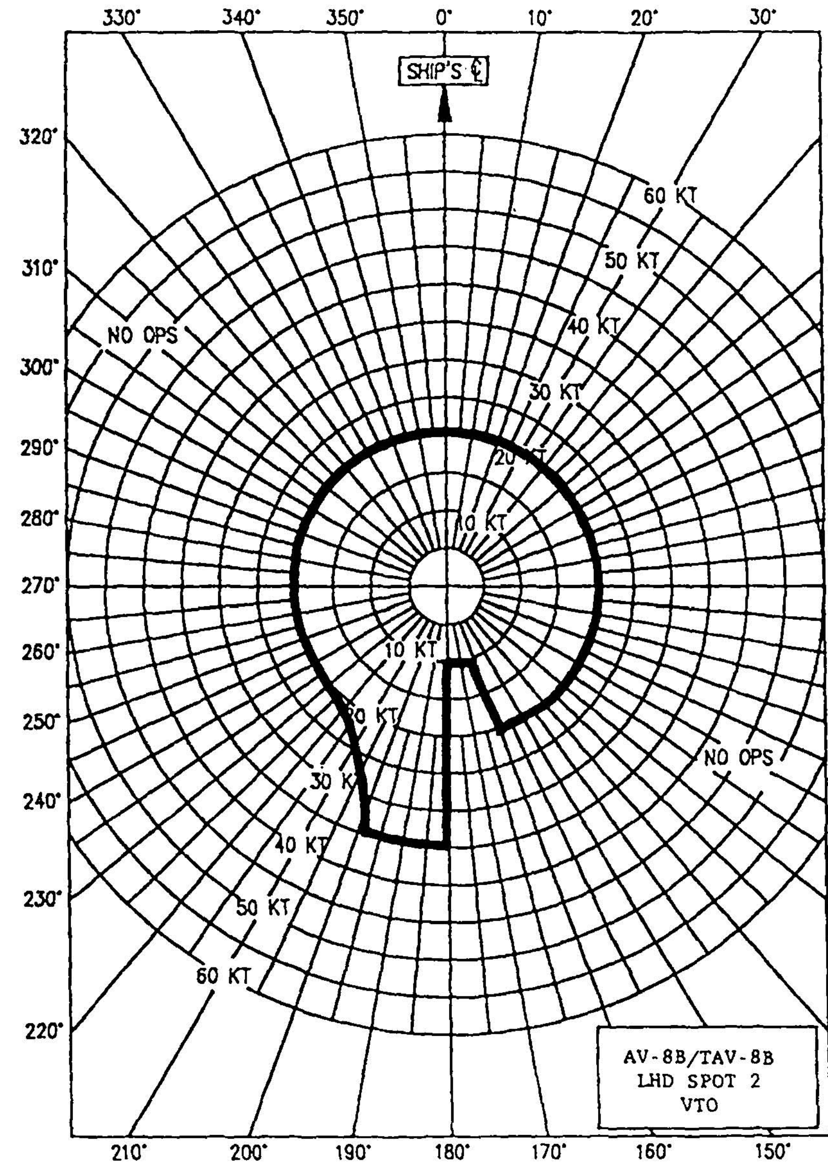


Figure A-38. AV-8B/TAV-8B Ship WOD Spot Limitations — LHD/LHA-6 Spot 2 VTO




NOTES: (1) SHIP WOD LIMITATIONS ARE BASED ON SHIP SUPERSTRUCTURE INDUCED TURBULENCE, AIRCRAFT CROSSWIND LIMITS, AND ADEQUACY OF VISUAL REFERENCES.

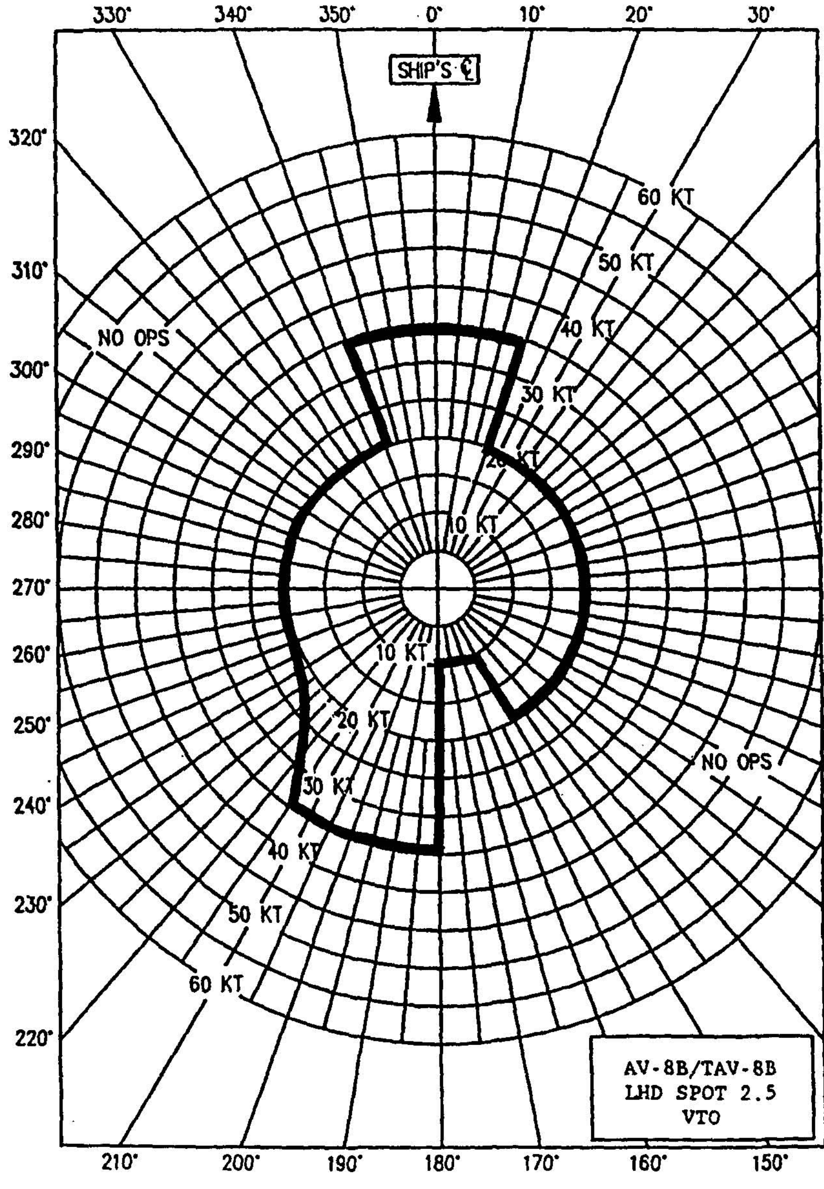
(2) DAY ONLY.

(3) MAXIMUM CROSSWIND COMPONENT 15 KNOTS FOR AV-8B, AND 10 KNOTS FOR TAV-8B.

(4) VTO OPERATIONS ARE NOT RECOMMENDED IF THERE IS SIGNIFICANT DECK MOTION.

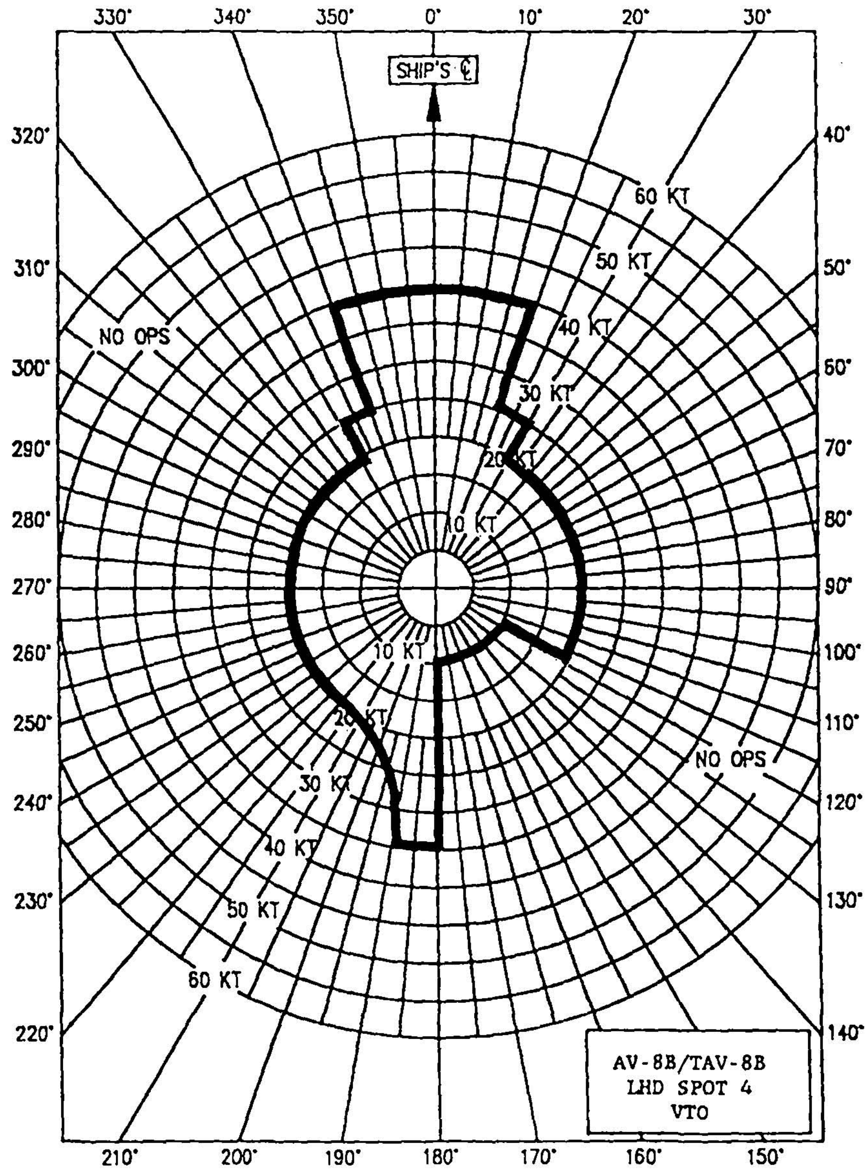
(5) APPLY 25-KNOT WOD PERFORMANCE CORRECTION TO VTO WEIGHT FOR VTO OPERATIONS WITH CROSSWIND COMPONENTS GREATER THAN 10 KNOTS.

Figure A-39. AV-8B/TAV-8B Ship WOD Spot Limitations — LHD/LHA-6 Spot 2.5 VTO



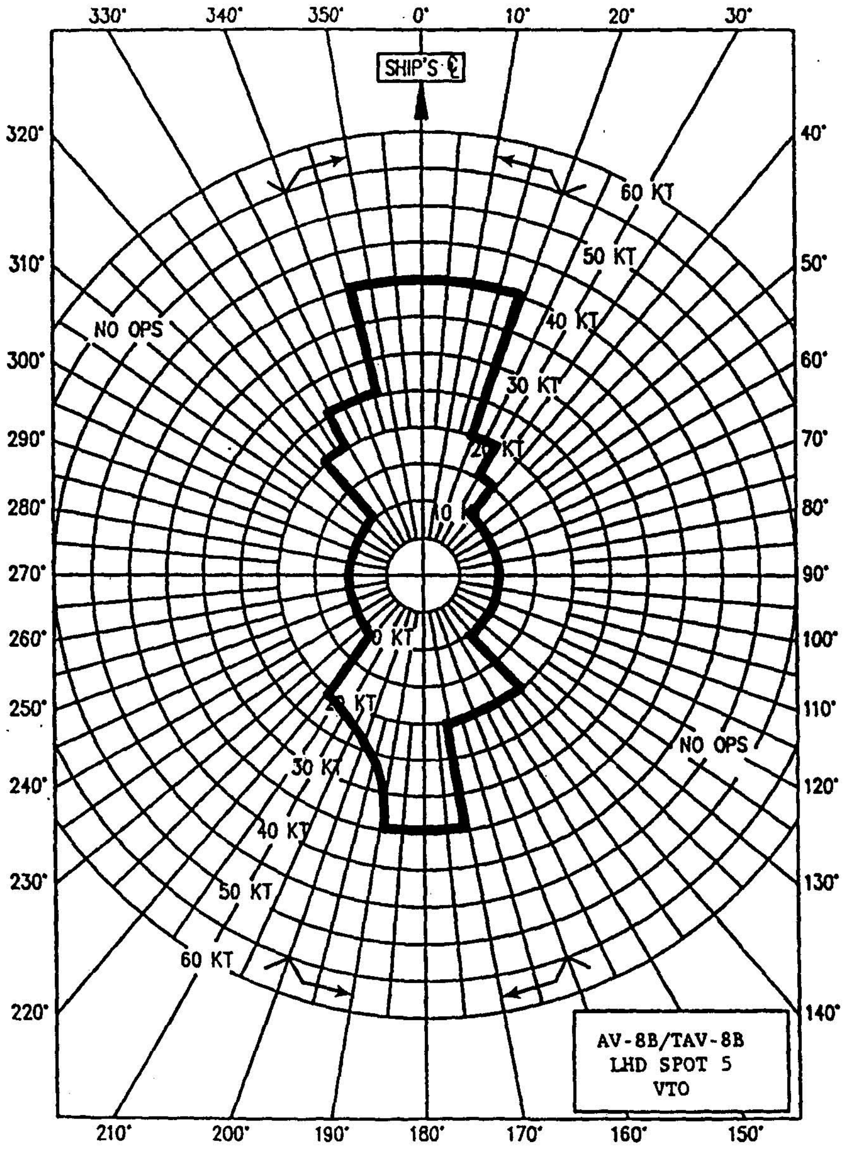

NOTES:
(1) SHIP WOD LIMITATIONS ARE BASED ON SHIP SUPERSTRUCTURE INDUCED TURBULENCE, AIRCRAFT CROSSWIND LIMITS, AND ADEQUACY OF VISUAL REFERENCES.
(2) DAY ONLY.
(3) MAXIMUM CROSSWIND COMPONENT 15 KNOTS FOR AV-8B, AND 10 KNOTS FOR TAV-8B.
(4) VTO OPERATIONS ARE NOT RECOMMENDED IF THERE IS SIGNIFICANT DECK MOTION.
(5) APPLY 25-KNOT WOD PERFORMANCE CORRECTION TO VTO WEIGHT FOR VTO OPERATIONS WITH CROSSWIND COMPONENTS GREATER THAN 10 KNOTS.

Figure A-40. AV-8B/TAV-8B Ship WOD Spot Limitations — LHD/LHA-6 Spot 4 VTO




NOTES: (1) SHIP WOD LIMITATIONS ARE BASED ON SHIP SUPERSTRUCTURE INDUCED TURBULENCE, AIRCRAFT CROSSWIND LIMITS, AND ADEQUACY OF VISUAL REFERENCES.
(2) DAY ONLY.
(3) MAXIMUM CROSSWIND COMPONENT 15 KNOTS FOR AV-8B, AND 10 KNOTS FOR TAV-8B.
(4) VTO OPERATIONS ARE NOT RECOMMENDED IF THERE IS SIGNIFICANT DECK MOTION.
(5) APPLY 25-KNOT WOD PERFORMANCE CORRECTION TO VTO WEIGHT FOR VTO OPERATIONS WITH CROSSWIND COMPONENTS GREATER THAN 10 KNOTS.

Figure A-41. AV-8B/TAV-8B Ship WOD Spot Limitations — LHD/LHA-6 Spot 5 VTO




NOTES: (1) SHIP WOD LIMITATIONS ARE BASED ON SHIP SUPERSTRUCTURE INDUCED TURBULENCE, AIRCRAFT CROSSWIND LIMITS, AND ADEQUACY OF VISUAL REFERENCES.

(2) VISUAL REFERENCE LIMITS ARE INDICATED BY V⟶.

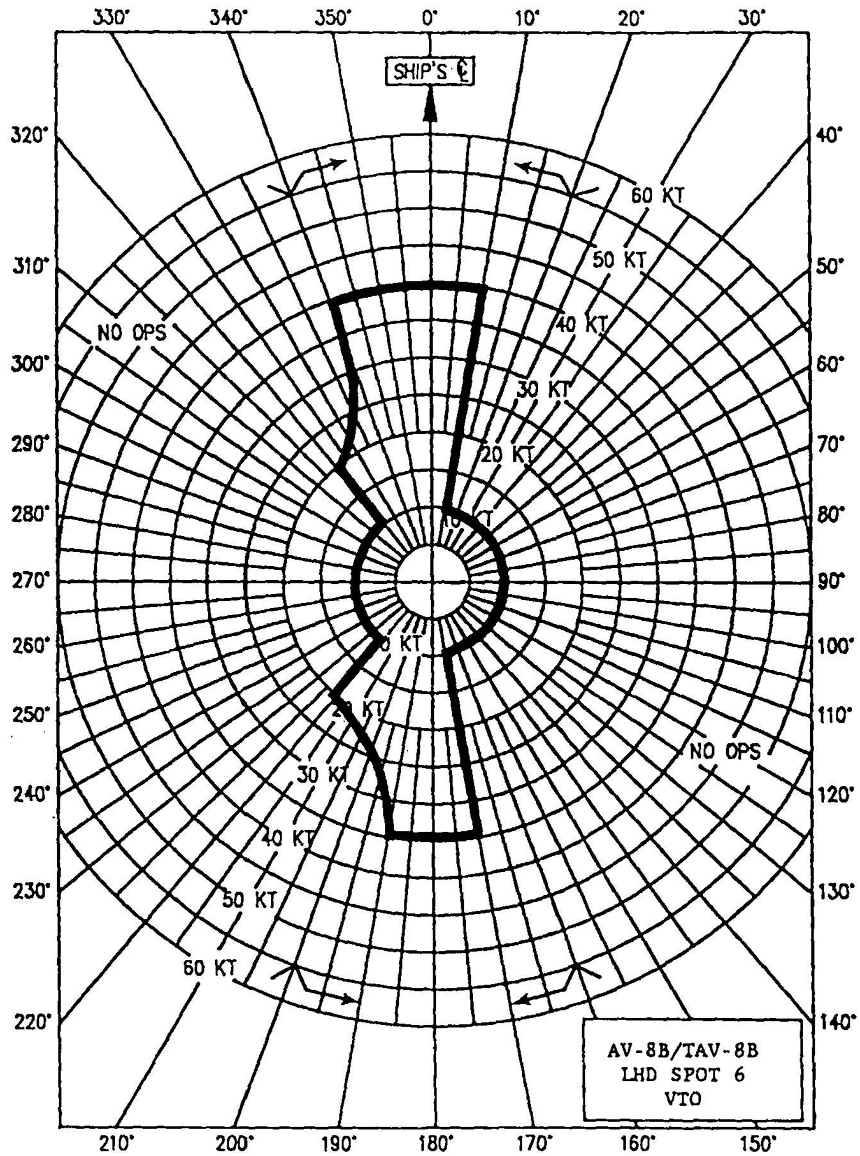
(3) DAY ONLY.

(4) MAXIMUM CROSSWIND COMPONENT 15 KNOTS FOR AV-8B, AND 10 KNOTS FOR TAV-8B.

(5) VTO OPERATIONS ARE NOT RECOMMENDED IF THERE IS SIGNIFICANT DECK MOTION.

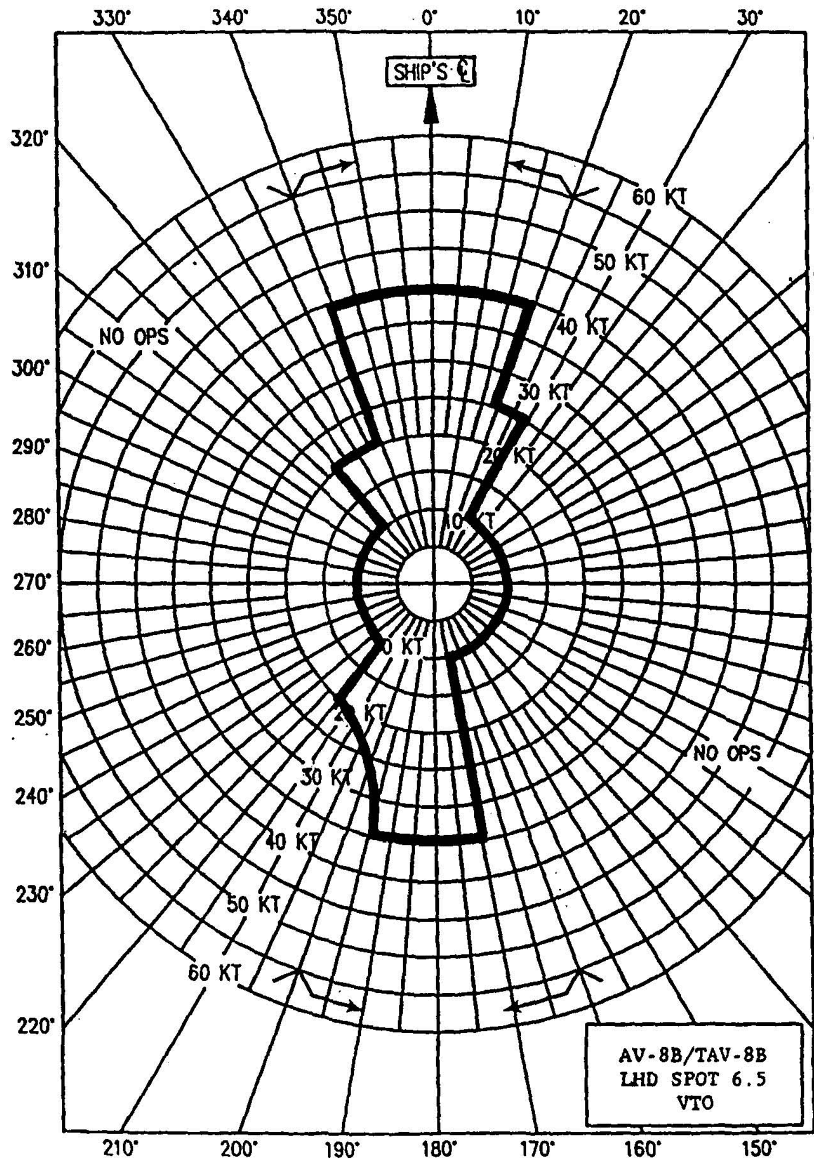
(6) APPLY 25-KNOT WOD PERFORMANCE CORRECTION TO VTO WEIGHT FOR VTO OPERATIONS WITH CROSSWIND COMPONENTS GREATER THAN 10 KNOTS.

Figure A-42. AV-8B/TAV-8B Ship WOD Spot Limitations — LHD/LHA-6 Spot 6 VTO



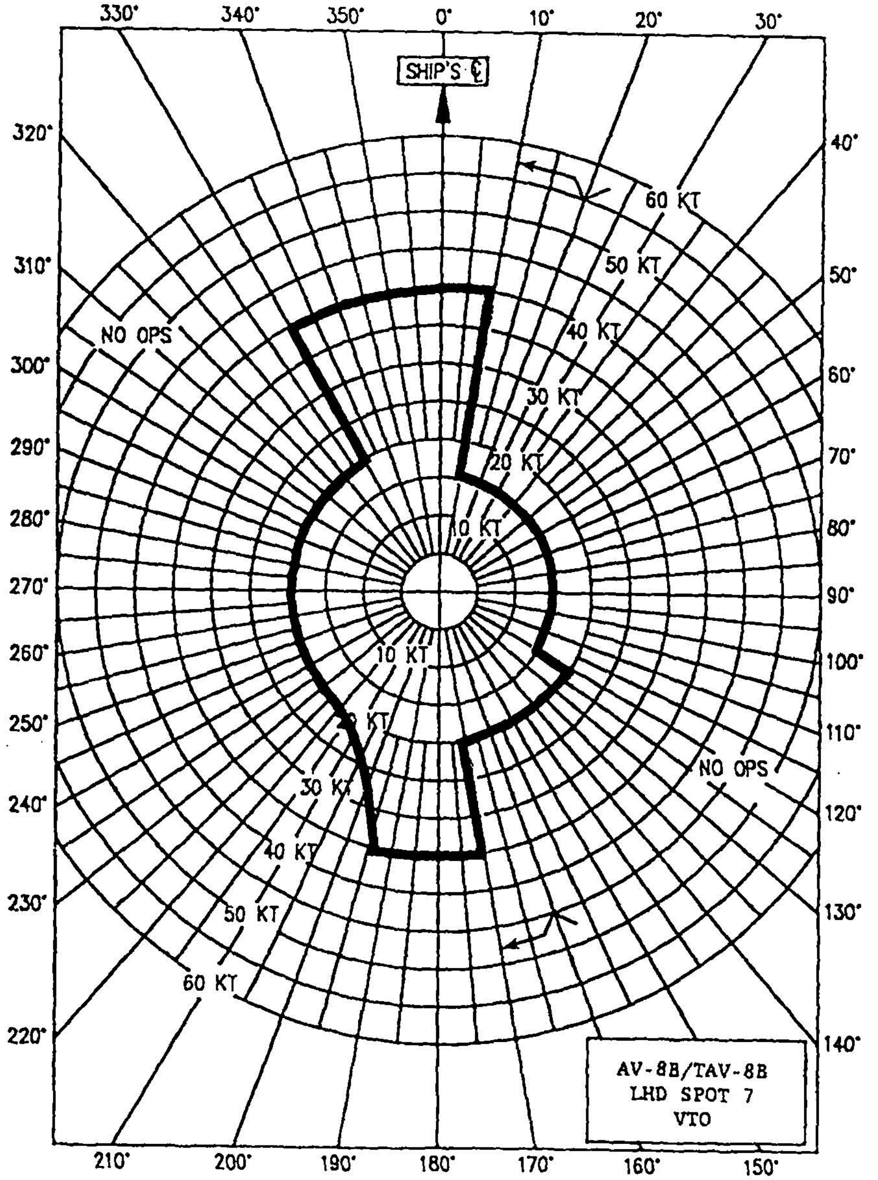

NOTES: (1) SHIP WOD LIMITATIONS ARE BASED ON SHIP SUPERSTRUCTURE INDUCED TURBULENCE, AIRCRAFT CROSSWIND LIMITS, AND ADEQUACY OF VISUAL REFERENCES.
(2) VISUAL REFERENCE LIMITS ARE INDICATED BY
(3) DAY ONLY.
(4) MAXIMUM CROSSWIND COMPONENT 15 KNOTS FOR AV-8B, AND 10 KNOTS FOR TAV-8B.
(5) VTO OPERATIONS ARE NOT RECOMMENDED IF THERE IS SIGNIFICANT DECK MOTION.
(6) APPLY 25-KNOT WOD PERFORMANCE CORRECTION TO VTO WEIGHT FOR VTO OPERATIONS WITH CROSSWIND COMPONENTS GREATER THAN 10 KNOTS.

Figure A-43. AV-8B/TAV-8B Ship WOD Spot Limitations — LHD/LHA-6 Spot 6.5 VTO



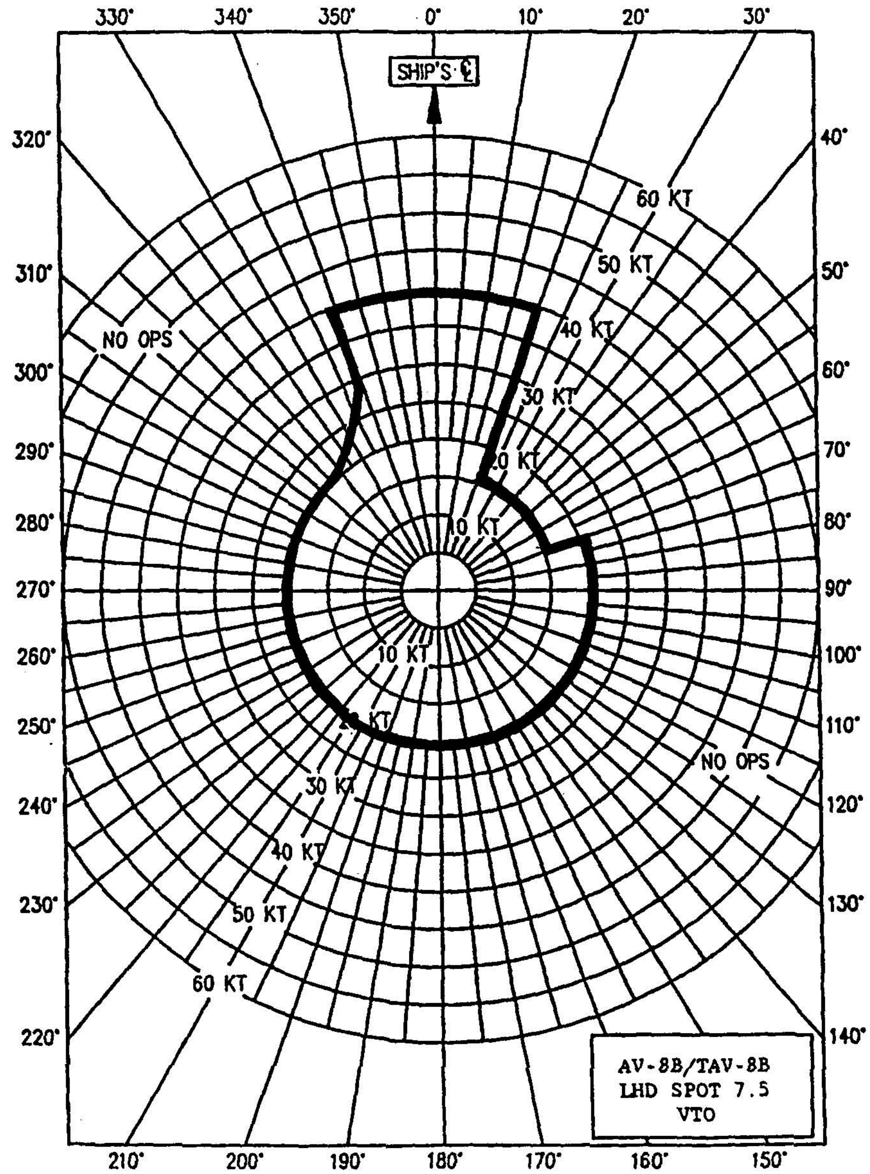

NOTES:
(1) SHIP WOD LIMITATIONS ARE BASED ON SHIP SUPERSTRUCTURE INDUCED TURBULENCE, AIRCRAFT CROSSWIND LIMITS, AND ADEQUACY OF VISUAL REFERENCES.
(2) VISUAL REFERENCE LIMITS ARE INDICATED BY √‾▸.
(3) DAY ONLY.
(4) MAXIMUM CROSSWIND COMPONENT 15 KNOTS FOR AV-8B, AND 10 KNOTS FOR TAV-8B.
(5) VTO OPERATIONS ARE NOT RECOMMENDED IF THERE IS SIGNIFICANT DECK MOTION.
(6) APPLY 25-KNOT WOD PERFORMANCE CORRECTION TO VTO WEIGHT FOR VTO OPERATIONS WITH CROSSWIND COMPONENTS GREATER THAN 10 KNOTS.

Figure A-44. AV-8B/TAV-8B Ship WOD Spot Limitations — LHD/LHA-6 Spot 7 VTO



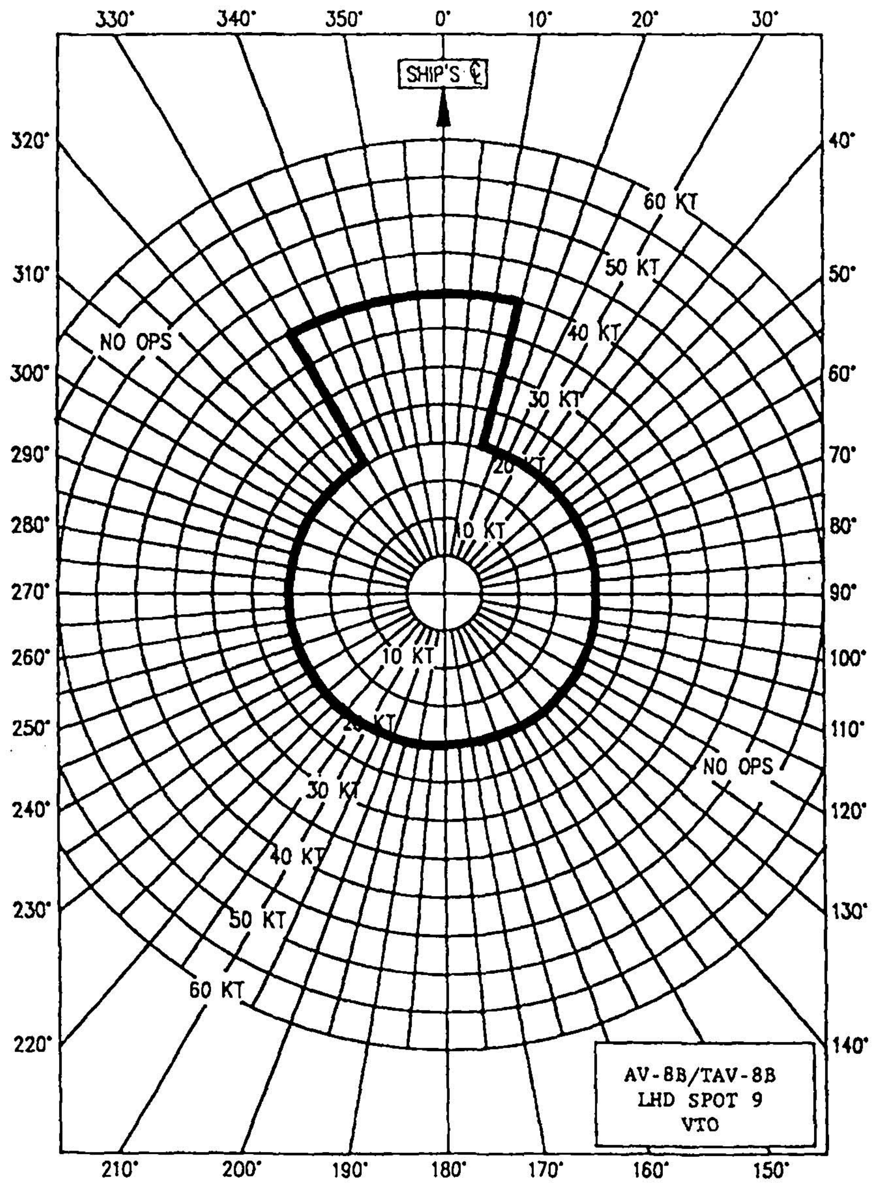

NOTES: (1) SHIP WOD LIMITATIONS ARE BASED ON SHIP SUPERSTRUCTURE INDUCED TURBULENCE, AIRCRAFT CROSSWIND LIMITS, AND ADEQUACY OF VISUAL REFERENCES.
(2) VISUAL REFERENCE LIMITS ARE INDICATED BY .
(3) DAY ONLY.
(4) MAXIMUM CROSSWIND COMPONENT 15 KNOTS FOR AV-8B, AND 10 KNOTS FOR TAV-8B.
(5) THIS SPOT IS RECOMMENDED IF THERE IS SIGNIFICANT DECK MOTION.
(6) APPLY 25-KNOT WOD PERFORMANCE CORRECTION TO VTO WEIGHT FOR VTO OPERATIONS WITH CROSSWIND COMPONENTS GREATER THAN 10 KNOTS.

Figure A-45. AV-8B/TAV-8B Ship WOD Spot Limitations — LHD/LHA-6 Spot 7.5 VTO




NOTES:
(1) SHIP WOD LIMITATIONS ARE BASED ON SHIP SUPERSTRUCTURE INDUCED TURBULENCE, AIRCRAFT CROSSWIND LIMITS, AND ADEQUACY OF VISUAL REFERENCES.
(2) DAY ONLY.
(3) MAXIMUM CROSSWIND COMPONENT 15 KNOTS FOR AV-8B, AND 10 KNOTS FOR TAV-8B.
(4) THIS SPOT IS RECOMMENDED IF THERE IS SIGNIFICANT DECK MOTION.
(5) APPLY 25-KNOT WOD PERFORMANCE CORRECTION TO VTO WEIGHT FOR VTO OPERATIONS WITH CROSSWIND COMPONENTS GREATER THAN 10 KNOTS.

Figure A-46. AV-8B/TAV-8B Ship WOD Spot Limitations — LHD/LHA-6 Spot 9 VTO




NOTES: (1) SHIP WOD LIMITATIONS ARE BASED ON SHIP SUPERSTRUCTURE INDUCED TURBULENCE, AIRCRAFT CROSSWIND LIMITS, AND ADEQUACY OF VISUAL REFERENCES.

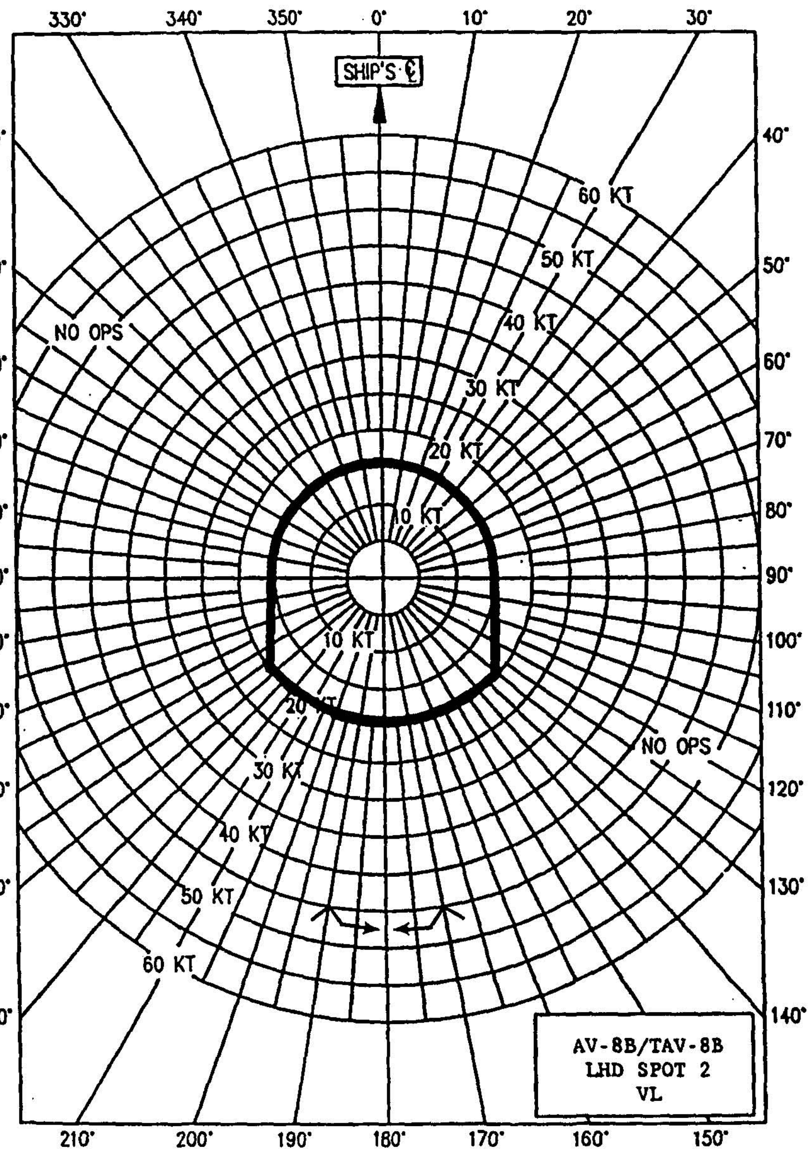
(2) DAY ONLY.

(3) MAXIMUM CROSSWIND COMPONENT 15 KNOTS FOR AV-8B, AND 10 KNOTS FOR TAV-8B.

(4) VTO OPERATIONS ARE NOT RECOMMENDED IF THERE IS SIGNIFICANT DECK MOTION.

(5) APPLY 25-KNOT WOD PERFORMANCE CORRECTION TO VTO WEIGHT FOR VTO OPERATIONS WITH CROSSWIND COMPONENTS GREATER THAN 10 KNOTS.

Figure A-47. AV-8B/TAV-8B Ship WOD Spot Limitations — LHD/LHA-6 Spot 2 VL




NOTES: (1) SHIP WOD LIMITATIONS ARE BASED ON SHIP SUPERSTRUCTURE INDUCED TURBULENCE, AIRCRAFT CROSSWIND LIMITS, AND ADEQUACY OF VISUAL REFERENCES.

(2) VISUAL REFERENCE LIMITS ARE INDICATED BY.

(3) VL OPERATIONS ARE NOT RECOMMENDED IF THERE IS SIGNIFICANT DECK MOTION.

(4) DAY ONLY.

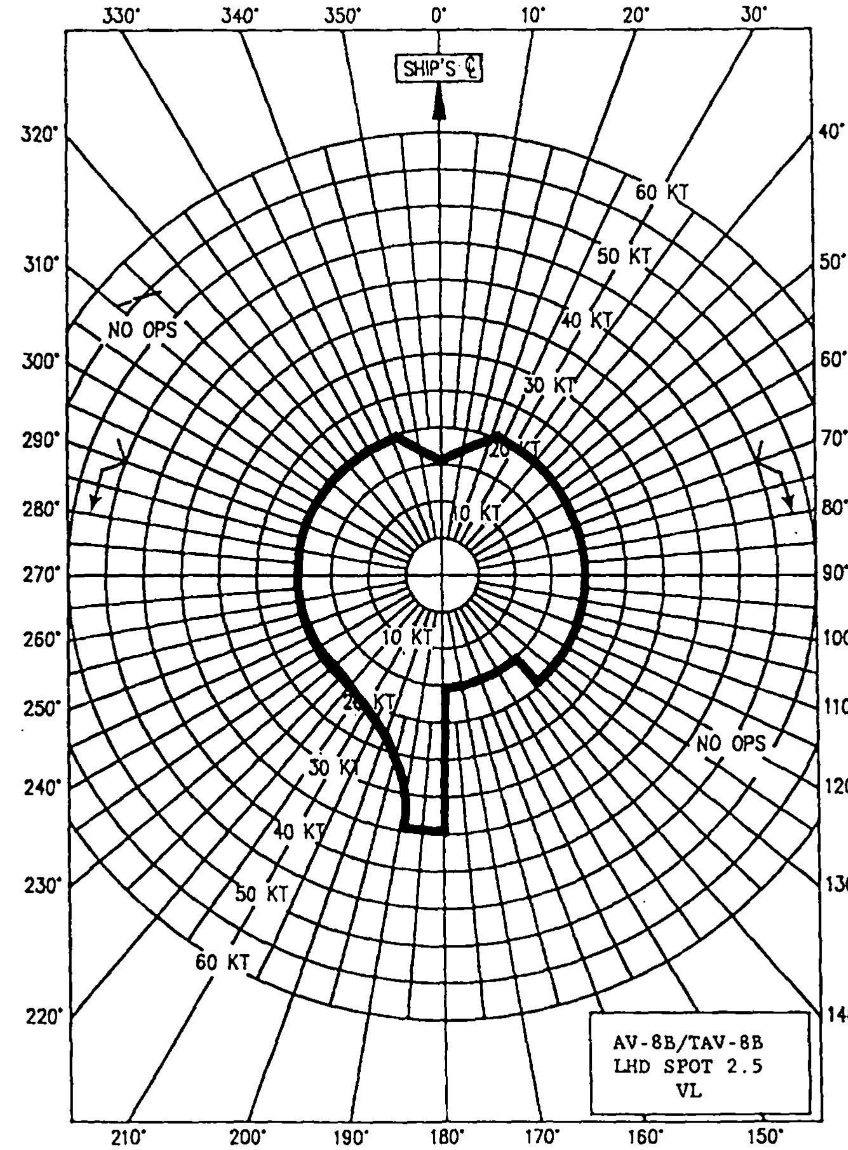
(5) MAXIMUM CROSSWIND COMPONENT 15 KNOTS FOR AV-8B, AND 10 KNOTS FOR TAV-8B.

(6) VL WITH TAV-8B AIRCRAFT SHALL BE PERFORMED ONLY FROM THE FRONT COCKPIT, EXCEPT IN EMERGENCY.

(7) FOR TAV-8B AIRCRAFT, A 500 LB REDUCTION IN VL WEIGHT IS REQUIRED.

(8) APPLY 25-KNOT WOD PERFORMANCE CORRECTION TO VL WEIGHT FOR VL OPERATIONS WITH CROSSWIND COMPONENTS GREATER THAN 10 KNOTS.

Figure A-48. AV-8B/TAV-8B Ship WOD Spot Limitations — LHD/LHA-6 Spot 2.5 VL




NOTES: (1) SHIP WOD LIMITATIONS ARE BASED ON SHIP SUPERSTRUCTURE INDUCED TURBULENCE, AIRCRAFT CROSSWIND LIMITS, AND ADEQUACY OF VISUAL REFERENCES.

(2) VISUAL REFERENCE LIMITS ARE INDICATED BY

(3) VL OPERATIONS ARE NOT RECOMMENDED IF THERE IS SIGNIFICANT DECK MOTION.

(4) DAY CROSS-AXIAL APPROACHES ARE PERMITTED TO THIS SPOT.

(5) DAY ONLY.

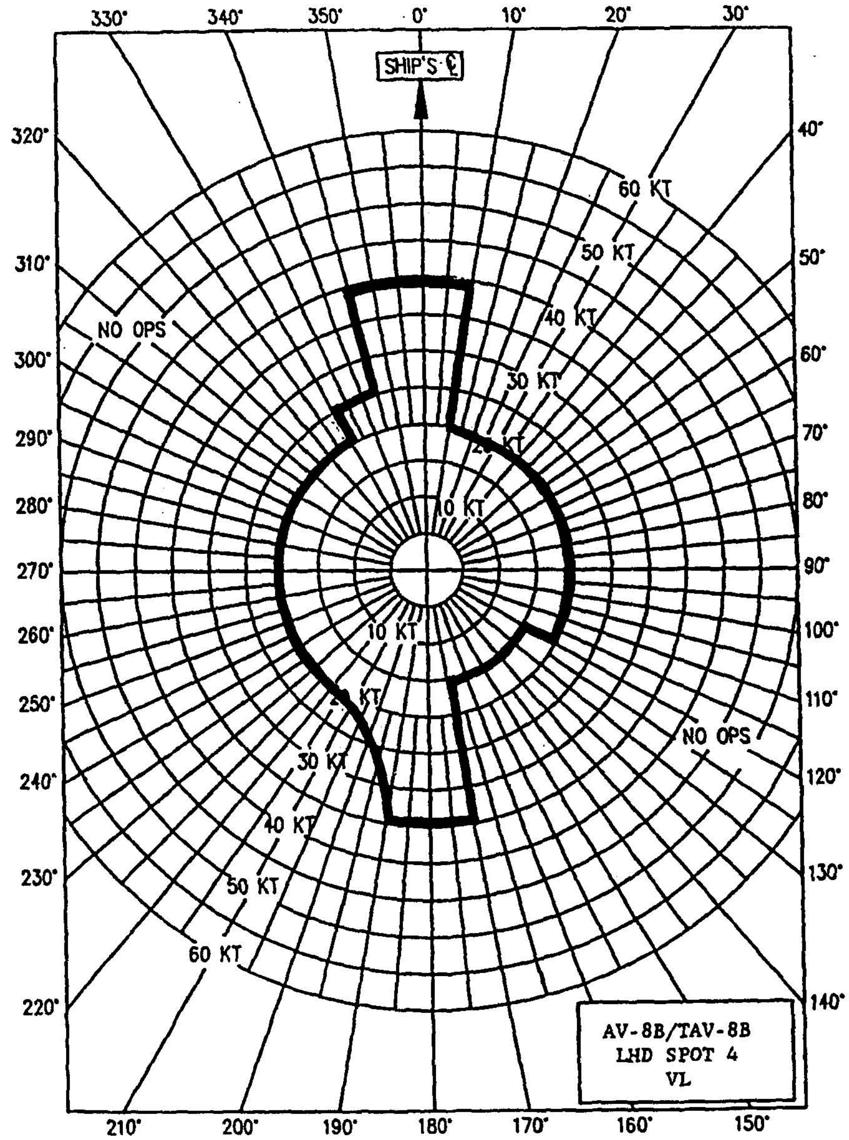
(6) MAXIMUM CROSSWIND COMPONENT 15 KNOTS FOR AV-8B, AND 10 KNOTS FOR TAV-8B.

(7) VL WITH TAV-8B AIRCRAFT SHALL BE PERFORMED ONLY FROM THE FRONT COCKPIT, EXCEPT IN EMERGENCY.

(8) FOR TAV-8B AIRCRAFT, A 500 LB REDUCTION IN VL WEIGHT IS REQUIRED.

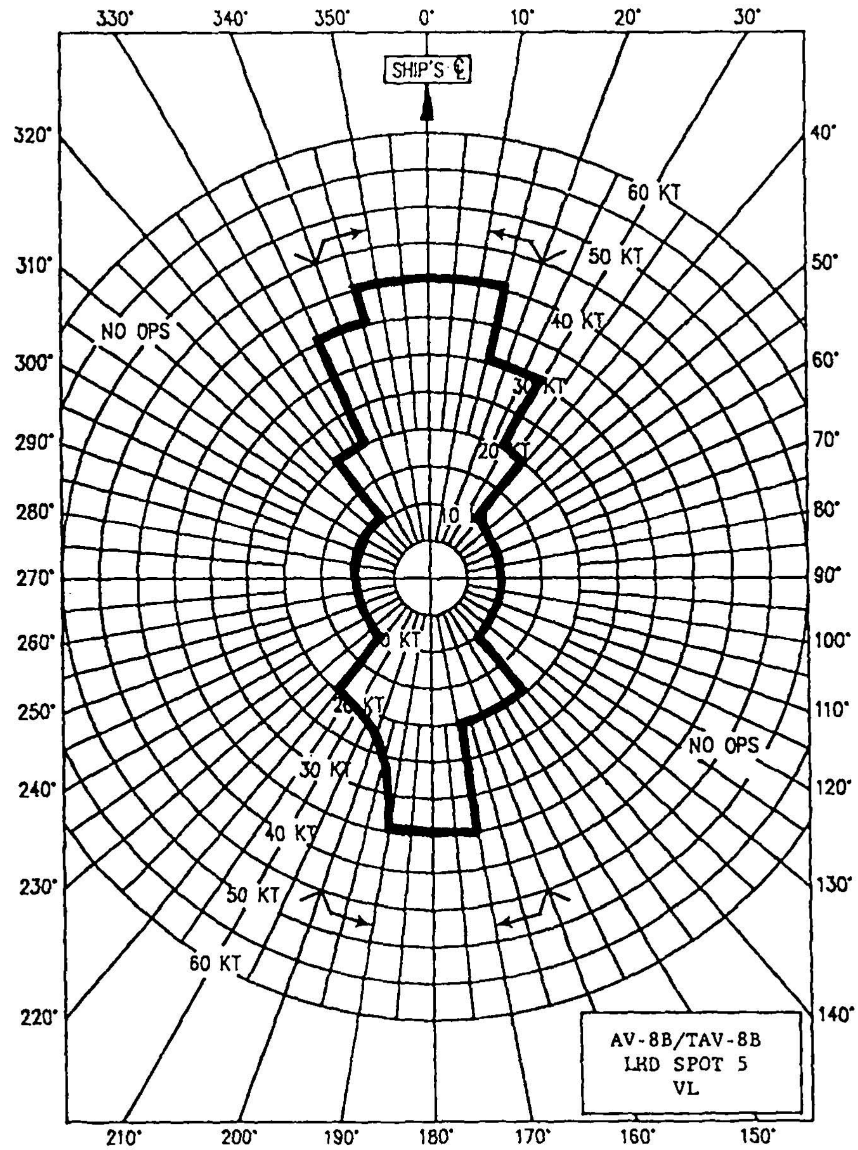
(9) APPLY 25-KNOT WOD PERFORMANCE CORRECTION TO VL WEIGHT FOR VL OPERATIONS WITH CROSSWIND COMPONENTS GREATER THAN 10 KNOTS.

Figure A-49. AV-8B/TAV-8B Ship WOD Spot Limitations — LHD/LHA-6 Spot 4 VL



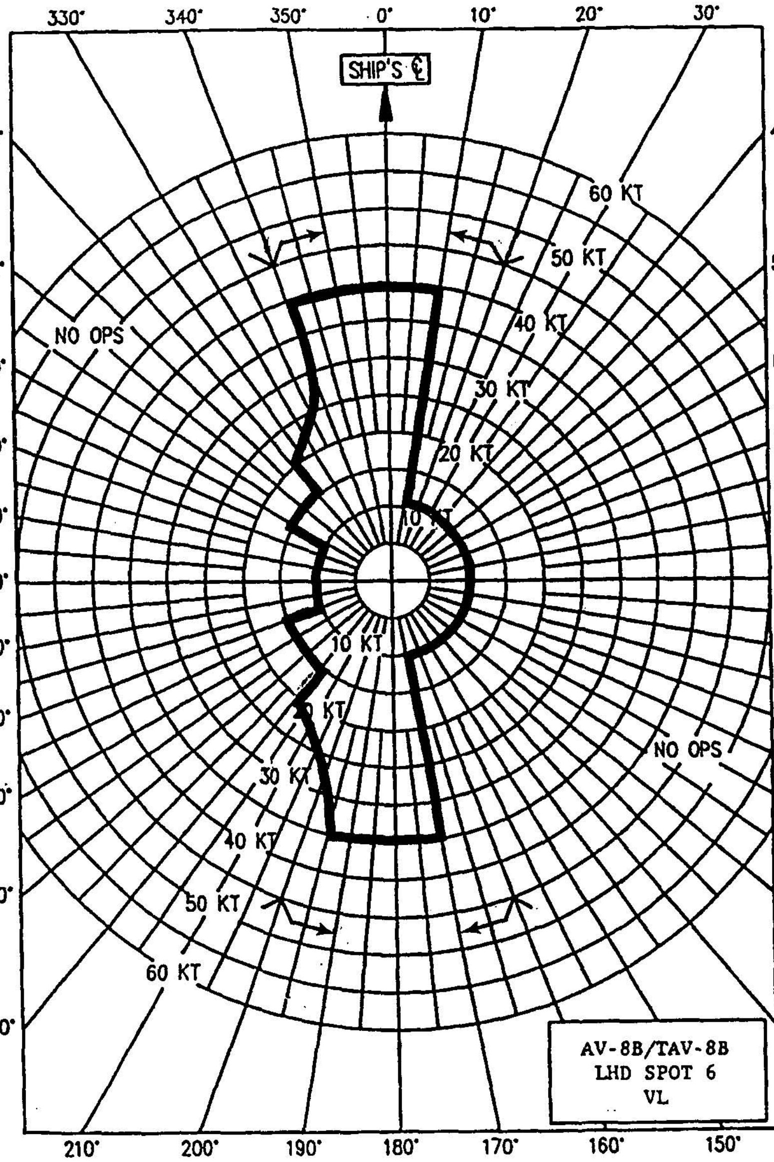

NOTES:
(1) SHIP WOD LIMITATIONS ARE BASED ON SHIP SUPERSTRUCTURE INDUCED TURBULENCE, AIRCRAFT CROSSWIND LIMITS, AND ADEQUACY OF VISUAL REFERENCES.
(2) VL OPERATIONS ARE NOT RECOMMENDED IF THERE IS SIGNIFICANT DECK MOTION.
(3) DAY CROSS-AXIAL APPROACHES ARE PERMITTED TO THIS SPOT.
(4) DAY ONLY.
(5) MAXIMUM CROSSWIND COMPONENT 15 KNOTS FOR AV-8B, AND 10 KNOTS FOR TAV-8B.
(6) VL WITH TAV-8B AIRCRAFT SHALL BE PERFORMED ONLY FROM THE FRONT COCKPIT, EXCEPT IN EMERGENCY.
(7) FOR TAV-8B AIRCRAFT, A 500 LB REDUCTION IN VL WEIGHT IS REQUIRED.
(8) APPLY 25-KNOT WOD PERFORMANCE CORRECTION TO VL WEIGHT FOR VL OPERATIONS WITH CROSSWIND COMPONENTS GREATER THAN 10 KNOTS.

Figure A-50. AV-8B/TAV-8B Ship WOD Spot Limitations — LHD/LHA-6 Spot 5 VL




NOTES:
(1) SHIP WOD LIMITATIONS ARE BASED ON SHIP SUPERSTRUCTURE INDUCED TURBULENCE, AIRCRAFT CROSSWIND LIMITS, AND ADEQUACY OF VISUAL REFERENCES.
(2) VISUAL REFERENCE LIMITS ARE INDICATED BY
(3) VL OPERATIONS ARE NOT RECOMMENDED IF THERE IS SIGNIFICANT DECK MOTION.
(4) DAY ONLY.
(5) MAXIMUM CROSSWIND COMPONENT 15 KNOTS FOR AV-8B, AND 10 KNOTS FOR TAV-8B.
(6) VL WITH TAV-8B AIRCRAFT SHALL BE PERFORMED ONLY FROM THE FRONT COCKPIT, EXCEPT IN EMERGENCY.
(7) FOR TAV-8B AIRCRAFT, A 500 LB REDUCTION IN VL WEIGHT IS REQUIRED.
(8) APPLY 25-KNOT WOD PERFORMANCE CORRECTION TO VL WEIGHT FOR VL OPERATIONS WITH CROSSWIND COMPONENTS GREATER THAN 10 KNOTS.

Figure A-51. AV-8B/TAV-8B Ship WOD Spot Limitations — LHD/LHA-6 Spot 6 VL




NOTES: (1) SHIP WOD LIMITATIONS ARE BASED ON SHIP SUPERSTRUCTURE INDUCED TURBULENCE, AIRCRAFT CROSSWIND LIMITS, AND ADEQUACY OF VISUAL REFERENCES.

(2) VISUAL REFERENCE LIMITS ARE INDICATED BY √→.

(3) VL OPERATIONS ARE NOT RECOMMENDED IF THERE IS SIGNIFICANT DECK MOTION.

(4) DAY ONLY.

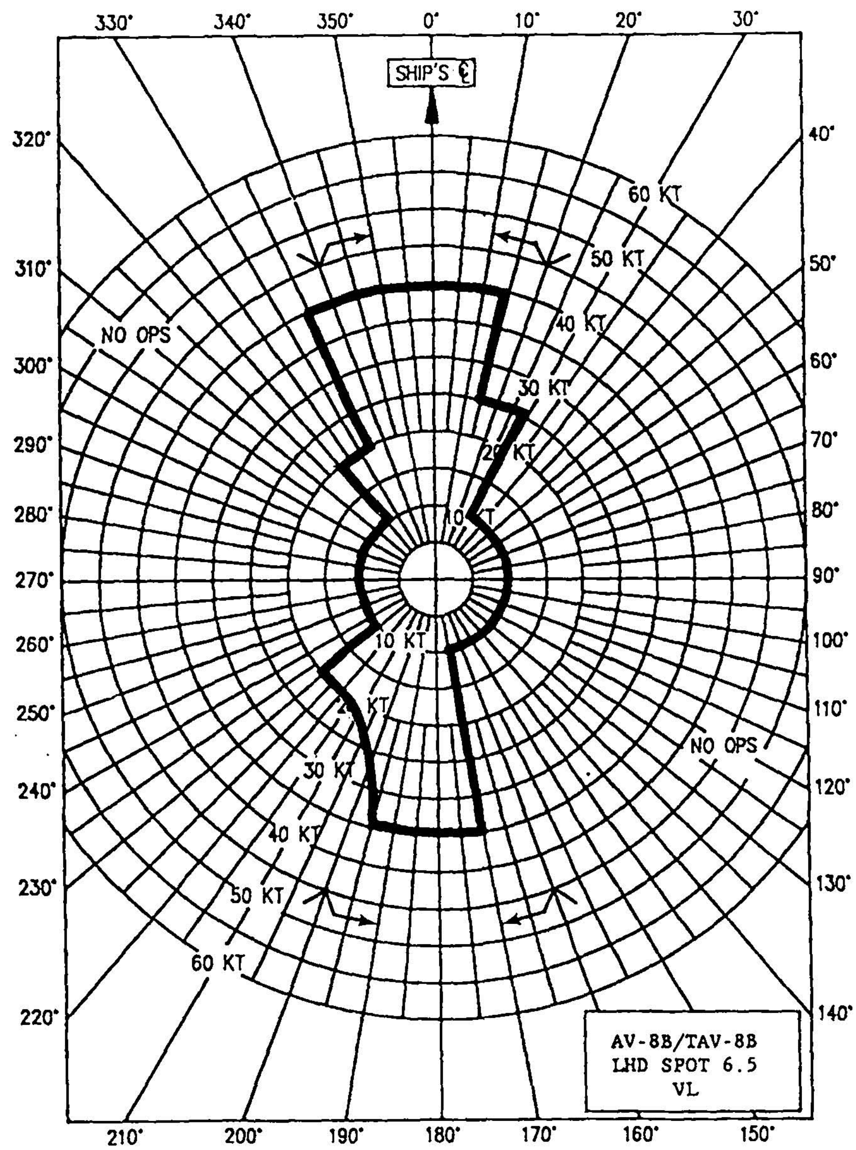
(5) MAXIMUM CROSSWIND COMPONENT 15 KNOTS FOR AV-8B, AND 10 KNOTS FOR TAV-8B.

(6) VL WITH TAV-8B AIRCRAFT SHALL BE PERFORMED ONLY FROM THE FRONT COCKPIT, EXCEPT IN EMERGENCY.

(7) FOR TAV-8B AIRCRAFT, A 500 LB REDUCTION IN VL WEIGHT IS REQUIRED.

(8) APPLY 25-KNOT WOD PERFORMANCE CORRECTION TO VL WEIGHT FOR VL OPERATIONS WITH CROSSWIND COMPONENTS GREATER THAN 10 KNOTS.

Figure A-52. AV-8B/TAV-8B Ship WOD Spot Limitations — LHD/LHA-6 Spot 6.5 VL




NOTES: (1) SHIP WOD LIMITATIONS ARE BASED ON SHIP SUPERSTRUCTURE INDUCED TURBULENCE, AIRCRAFT CROSSWIND LIMITS, AND ADEQUACY OF VISUAL REFERENCES.

(2) VISUAL REFERENCE LIMITS ARE INDICATED BY ⟶.

(3) VL OPERATIONS ARE NOT RECOMMENDED IF THERE IS SIGNIFICANT DECK MOTION.

(4) DAY ONLY.

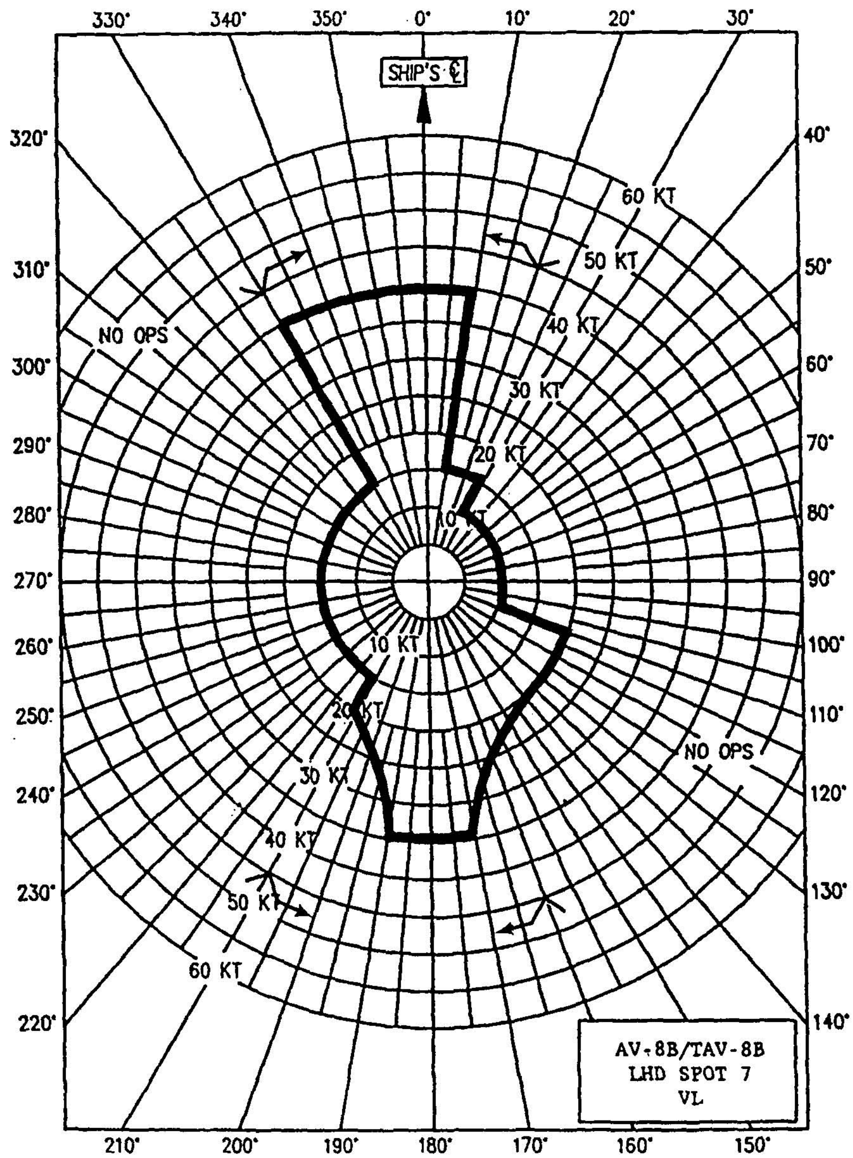
(5) MAXIMUM CROSSWIND COMPONENT 15 KNOTS FOR AV-8B, AND 10 KNOTS FOR TAV-8B.

(6) VL WITH TAV-8B AIRCRAFT SHALL BE PERFORMED ONLY FROM THE FRONT COCKPIT, EXCEPT IN EMERGENCY.

(7) FOR TAV-8B AIRCRAFT, A 500 LB REDUCTION IN VL WEIGHT IS REQUIRED.

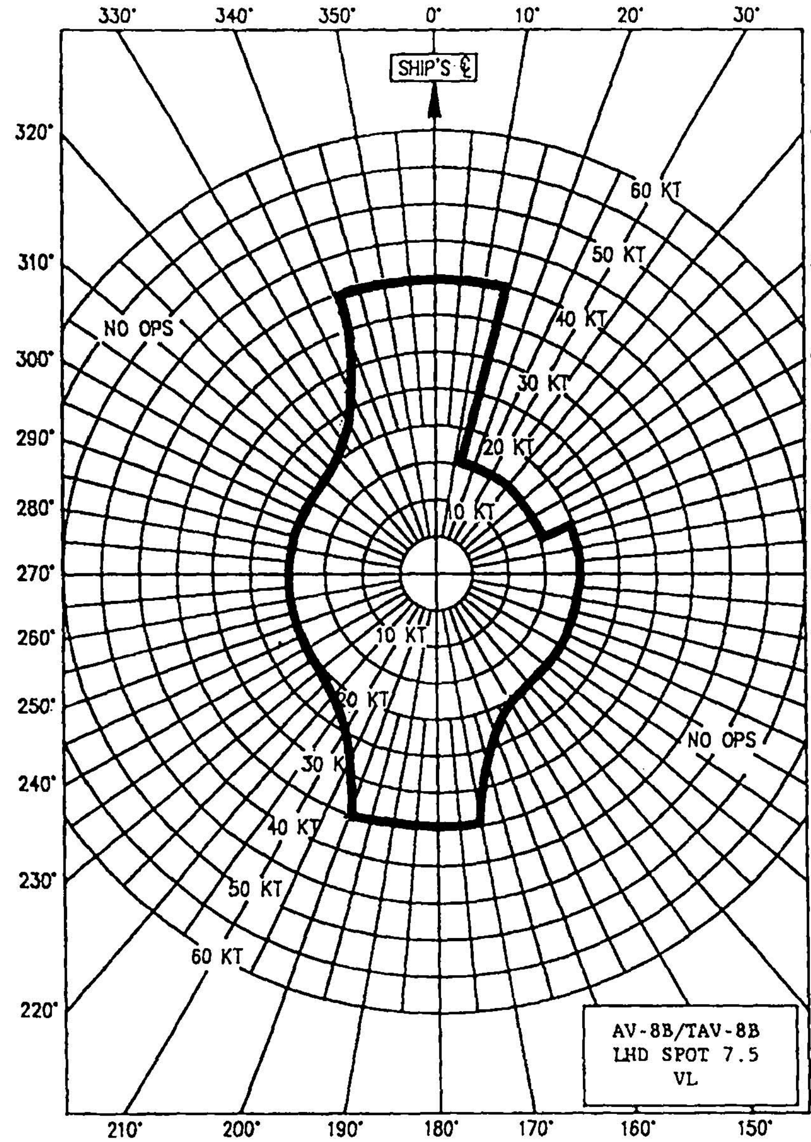
(8) APPLY 25-KNOT WOD PERFORMANCE CORRECTION TO VL WEIGHT FOR VL OPERATIONS WITH CROSSWIND COMPONENTS GREATER THAN 10 KNOTS.

Figure A-53. AV-8B/TAV-8B Ship WOD Spot Limitations — LHD/LHA-6 Spot 7 VL




NOTES: (1) SHIP WOD LIMITATIONS ARE BASED ON SHIP SUPERSTRUCTURE INDUCED TURBULENCE, AIRCRAFT CROSSWIND LIMITS, AND ADEQUACY OF VISUAL REFERENCES.
(2) VISUAL REFERENCE LIMITS ARE INDICATED BY ⟋→.
(3) THIS SPOT IS RECOMMENDED IF THERE IS SIGNIFICANT DECK MOTION.
(4) DAY ONLY.
(5) MAXIMUM CROSSWIND COMPONENT 15 KNOTS FOR AV-8B, AND 10 KNOTS FOR TAV-8B.
(6) VL WITH TAV-8B AIRCRAFT SHALL BE PERFORMED ONLY FROM THE FRONT COCKPIT, EXCEPT IN EMERGENCY.
(7) FOR TAV-8B AIRCRAFT, A 500 LB REDUCTION IN VL WEIGHT IS REQUIRED.
(8) APPLY 25-KNOT WOD PERFORMANCE CORRECTION TO VL WEIGHT FOR VL OPERATIONS WITH CROSSWIND COMPONENTS GREATER THAN 10 KNOTS.

Figure A-54. AV-8B/TAV-8B Ship WOD Spot Limitations — LHD/LHA-6 Spot 7.5 VL




NOTES: (1) SHIP WOD LIMITATIONS ARE BASED ON SHIP SUPERSTRUCTURE INDUCED TURBULENCE, AIRCRAFT CROSSWIND LIMITS, AND ADEQUACY OF VISUAL REFERENCES.

(2) THIS SPOT IS RECOMMENDED IF THERE IS SIGNIFICANT DECK MOTION.

(3) DAY CROSS-AXIAL APPROACHES ARE PERMITTED TO THIS SPOT.

(4) DAY ONLY.

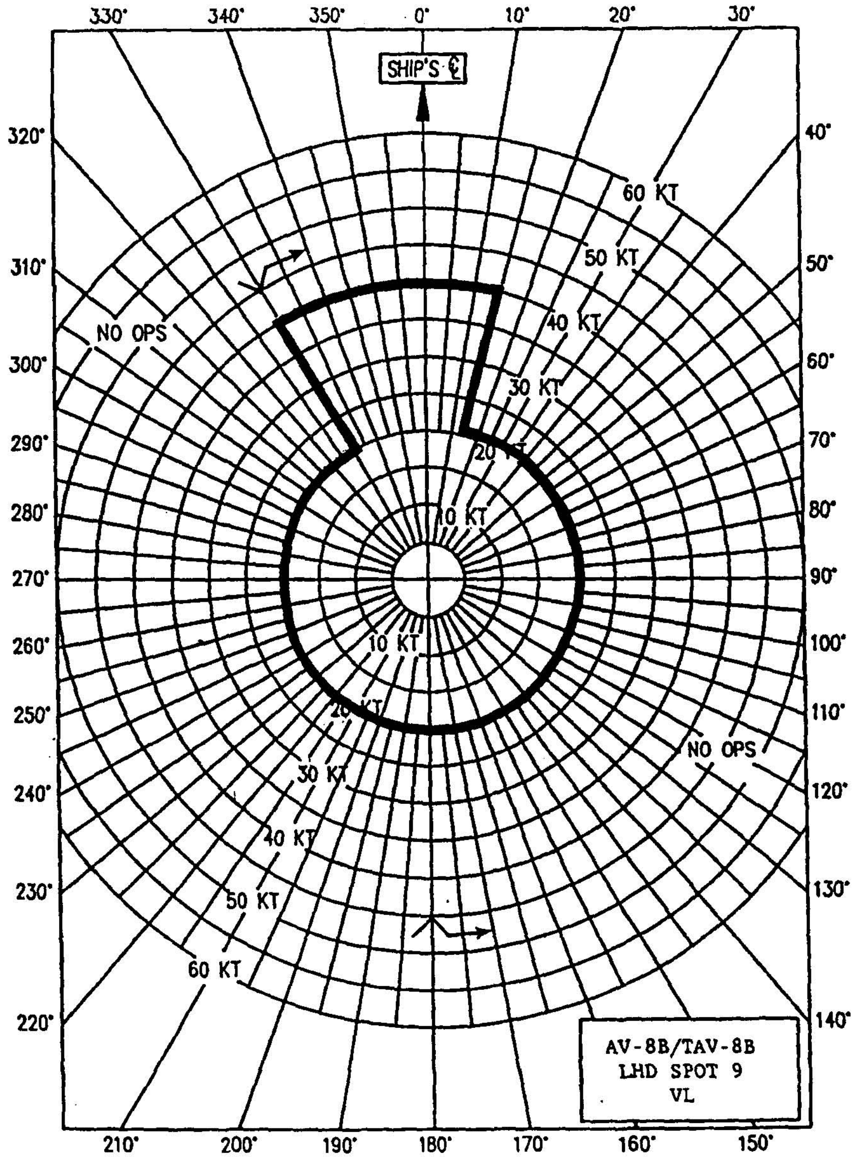
(5) MAXIMUM CROSSWIND COMPONENT 15 KNOTS FOR AV-8B, AND 10 KNOTS FOR TAV-8B.

(6) VL WITH TAV-8B AIRCRAFT SHALL BE PERFORMED ONLY FROM THE FRONT COCKPIT, EXCEPT IN EMERGENCY.

(7) FOR TAV-8B AIRCRAFT, A 500 LB REDUCTION IN VL WEIGHT IS REQUIRED.

(8) APPLY 25-KNOT WOD PERFORMANCE CORRECTION TO VL WEIGHT FOR VL OPERATIONS WITH CROSSWIND COMPONENTS GREATER THAN 10 KNOTS.

Figure A-55. AV-8B/TAV-8B Ship WOD Spot Limitations — LHD/LHA-6 Spot 9 VL




NOTES: (1) SHIP WOD LIMITATIONS ARE BASED ON SHIP SUPERSTRUCTURE INDUCED TURBULENCE, AIRCRAFT CROSSWIND LIMITS, AND ADEQUACY OF VISUAL REFERENCES.

(2) VISUAL REFERENCE LIMITS ARE INDICATED BY

(3) VL OPERATIONS ARE NOT RECOMMENDED IF THERE IS SIGNIFICANT DECK MOTION.

(4) DAY ONLY.

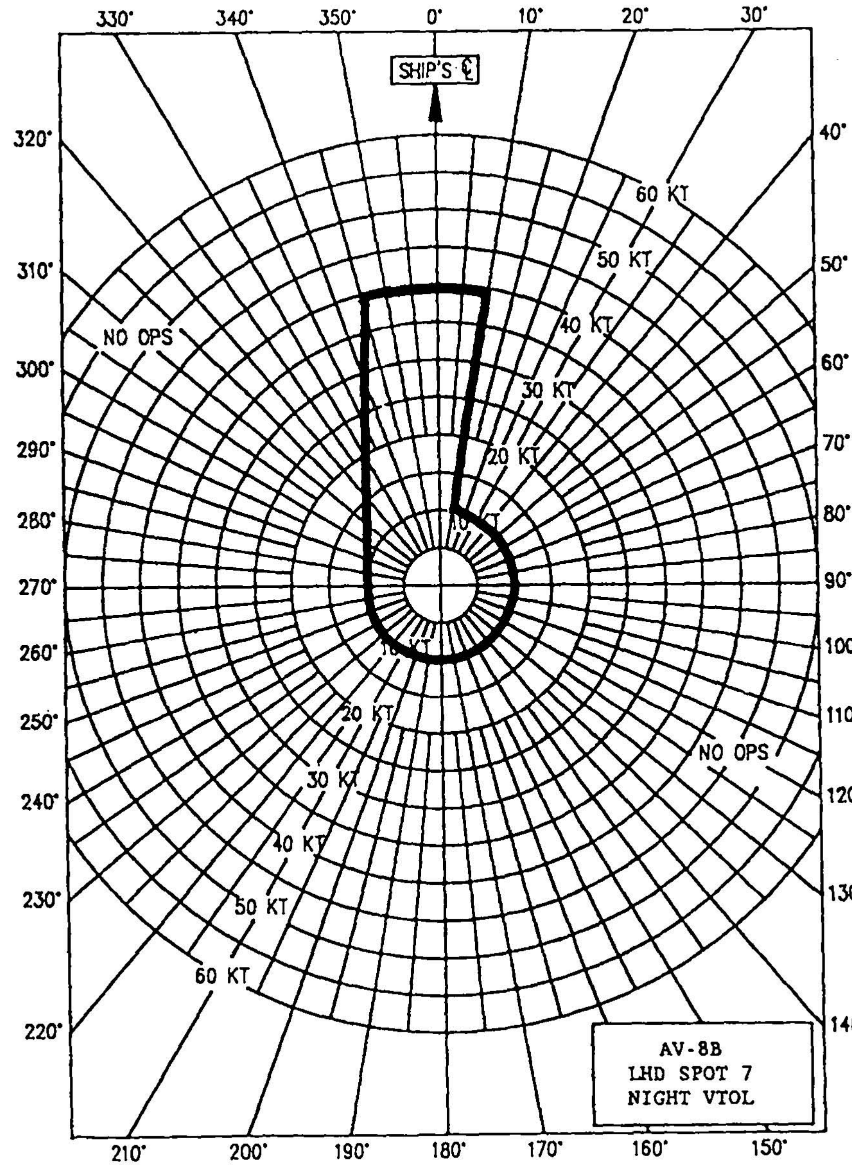
(5) MAXIMUM CROSSWIND COMPONENT 15 KNOTS FOR AV-8B, AND 10 KNOTS FOR TAV-8B.

(6) VL WITH TAV-8B AIRCRAFT SHALL BE PERFORMED ONLY FROM THE FRONT COCKPIT, EXCEPT IN EMERGENCY.

(7) FOR TAV-8B AIRCRAFT, A 500 LB REDUCTION IN VL WEIGHT IS REQUIRED.

(8) APPLY 25-KNOT WOD PERFORMANCE CORRECTION TO VL WEIGHT FOR VL OPERATIONS WITH CROSSWIND COMPONENTS GREATER THAN 10 KNOTS.

Figure A-56. AV-8B Ship WOD Spot Limitations — LHD/LHA-6 Spot 7 Night VTOL




NOTES: (1) SHIP WOD LIMITATIONS ARE BASED ON SHIP SUPERSTRUCTURE INDUCED TURBULENCE, AIRCRAFT CROSSWIND LIMITS, AND ADEQUACY OF VISUAL REFERENCES.

(2) MAXIMUM RECOMMENDED DECK MOTION IS ±1 DEGREE PITCH AND/OR ±4 DEGREES ROLL.

(3) ALL LANDINGS SHALL BE PERFORMED WITH THE AIRCRAFT ALIGNED WITH THE TRAM LINES.

(4) MAXIMUM CROSSWIND COMPONENT 10 KNOTS.

(5) NIGHT ONLY.

(6) NIGHT OPERATIONS WITH TAV-8B AIRCRAFT ARE PROHIBITED.

## A.8 F-35B LAUNCH AND RECOVERY LIMITATIONS

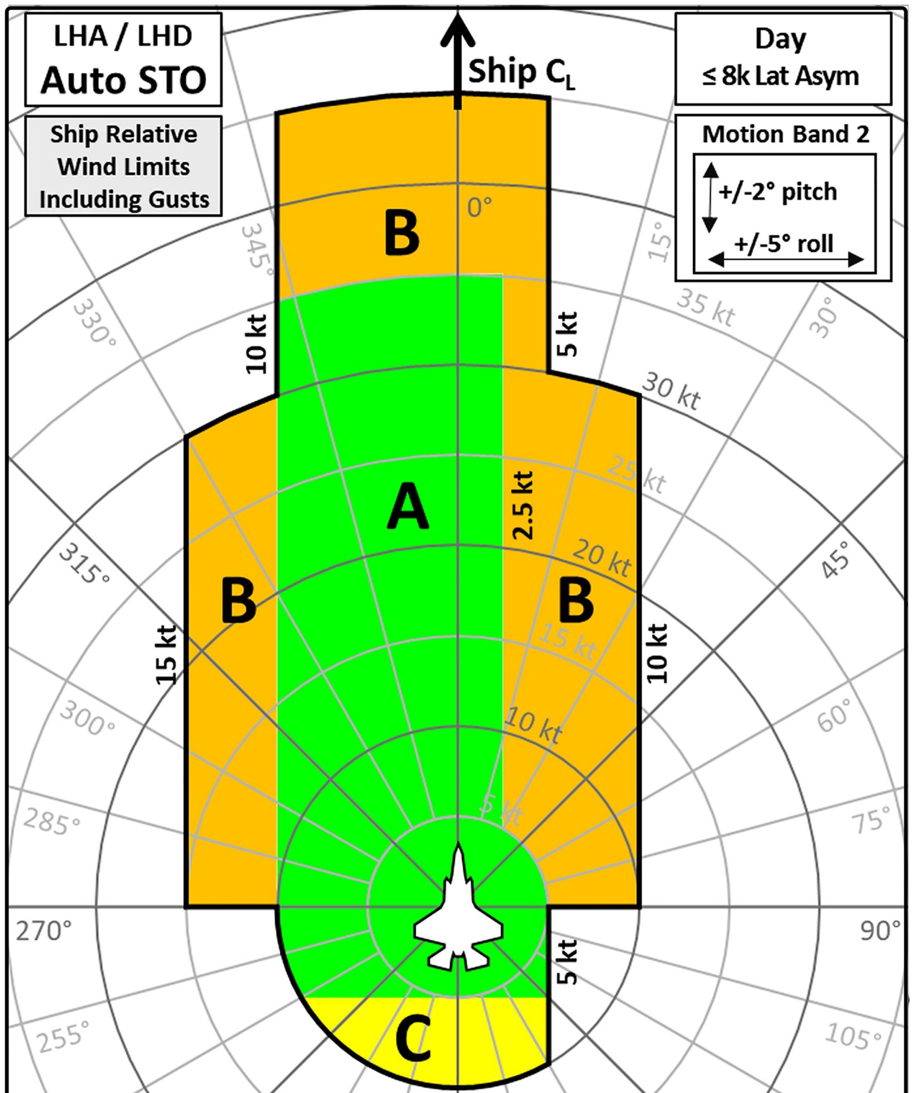
Figure A-57. STOVL Ship-based Short Takeoff / Auto STO (ASTO), Stick STO (SSTO), and Button STO (BSTO) Ship Relative Wind and Motion Limitations

| DAY/ NIGHT | STO TYPE | ABSOLUTE LAT ASYM (FT-LB) | MAX SHIP DECK ANGLES (1) | | | MAX DECK MOTION BAND | FIGURE NUMBER |
|---|---|---|---|---|---|---|---|
| | | | ROLL ANGLE | PITCH ANGLE | | | |
| | | | | BOW DOWN | BOW UP | | |
| Day | ASTO | ≤8k | ±5.0° | -2.0° | +2.0° | Band 2 | Figure A-58 |
| | | 8k to 12.5k | ±3.5° | -1.5° | +1.5° | Band 4 | Figure A-59 |
| Night | | ≤8k | ±3.5° | -1.5° | +1.5° | Band 4 | Figure A-60 |
| | | 8k to 12.5k | ±2.0° | -1.0° | +1.0° | Band 5 | Figure A-61 |
| Day / Night | SSTO / BSTO | ≤8k | ±2.0° | -1.0° | +1.0° | Band 5 | Figure A-62 |

NOTES:

1. Ship deck pitch and roll angles are absolute. Max angles include both trim and motion.

Figure A-58. Auto STO Day ≤ 8k Lat Asym Motion Band 2

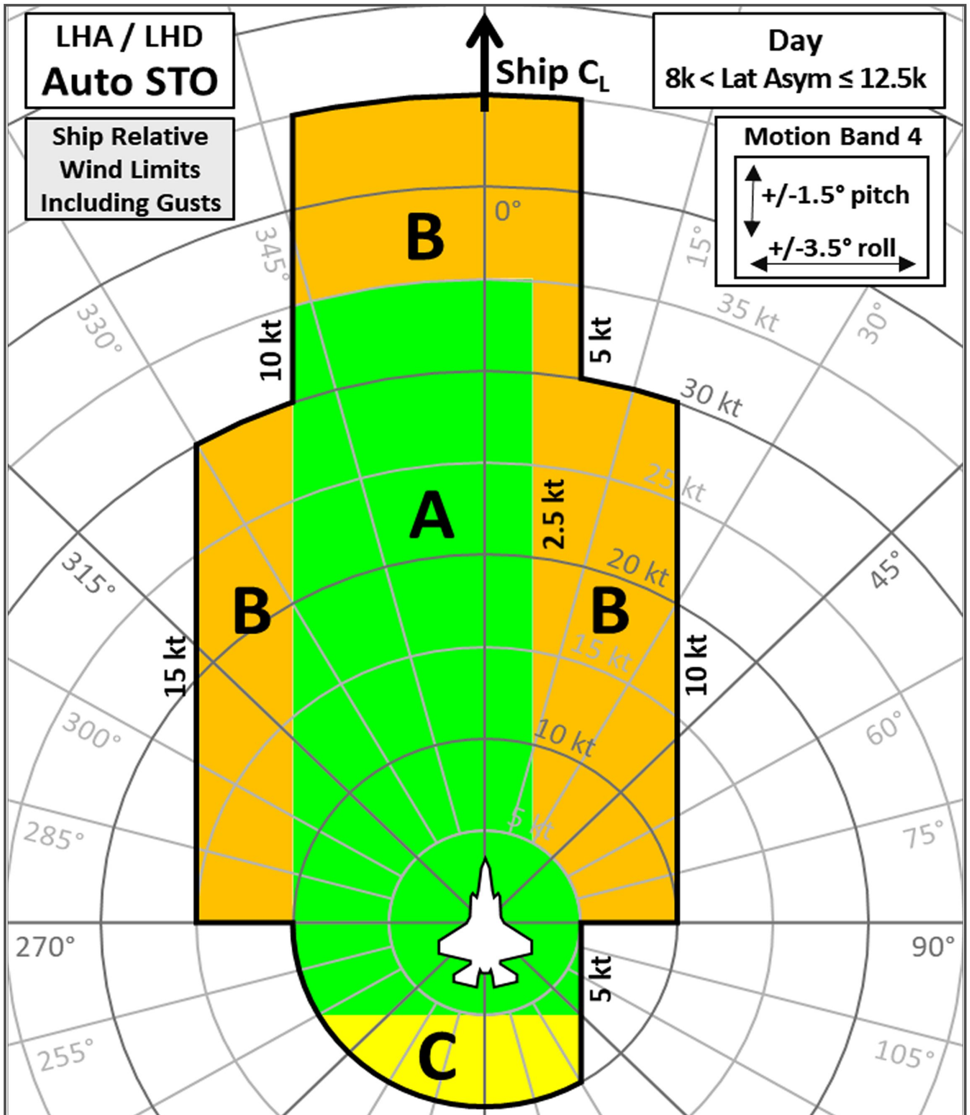



| Max Deck Motion Band | Max Ship Deck Roll Angle | Max Ship Deck Pitch Angle | |
|---|---|---|---|
| | | Bow Down | Bow Up |
| Band 2 | ± 5.0° | -2.0° | +2.0° |

NOTES:

1. Wind Regions are alphabetized according to performance capabilities from most performance (Region A) to least performance (Region C). Performance shall be calculated using the least-performance-wind-region coincident with the operating winds including excursions. Performance capability from a lesser alphabetical region can safely be used in a greater alphabetical region. Performance capability from a greater alphabetical region cannot be safely used in a lesser alphabetical region.

Figure A-59. Auto STO Day 8k < Lat Asym ≤ 12.5k Motion Band 4

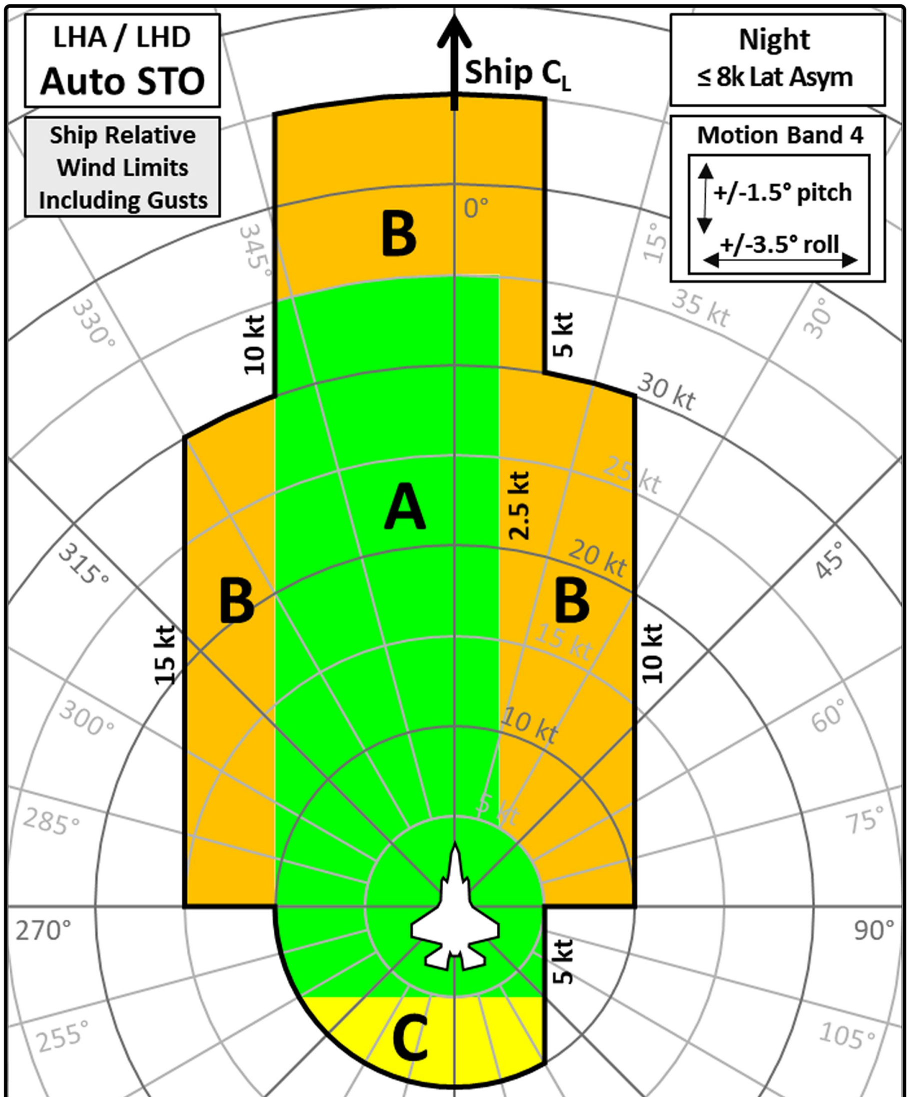



| Max Deck Motion Band | Max Ship Deck Roll Angle | Max Ship Deck Pitch Angle | |
|---|---|---|---|
| | | Bow Down | Bow Up |
| Band 4 | ± 3.5° | -1.5° | +1.5° |

Notes:

1. Wind Regions are alphabetized according to performance capabilities from most performance (Region A) to least performance (Region C). Performance shall be calculated using the least-performance-wind-region coincident with the operating winds including excursions. Performance capability from a lesser alphabetical region can safely be used in a greater alphabetical region. Performance capability from a greater alphabetical region cannot be safely used in a lesser alphabetical region.

Figure A-60. Auto STO Night ≤ 8k Lat Asym Motion Band 4

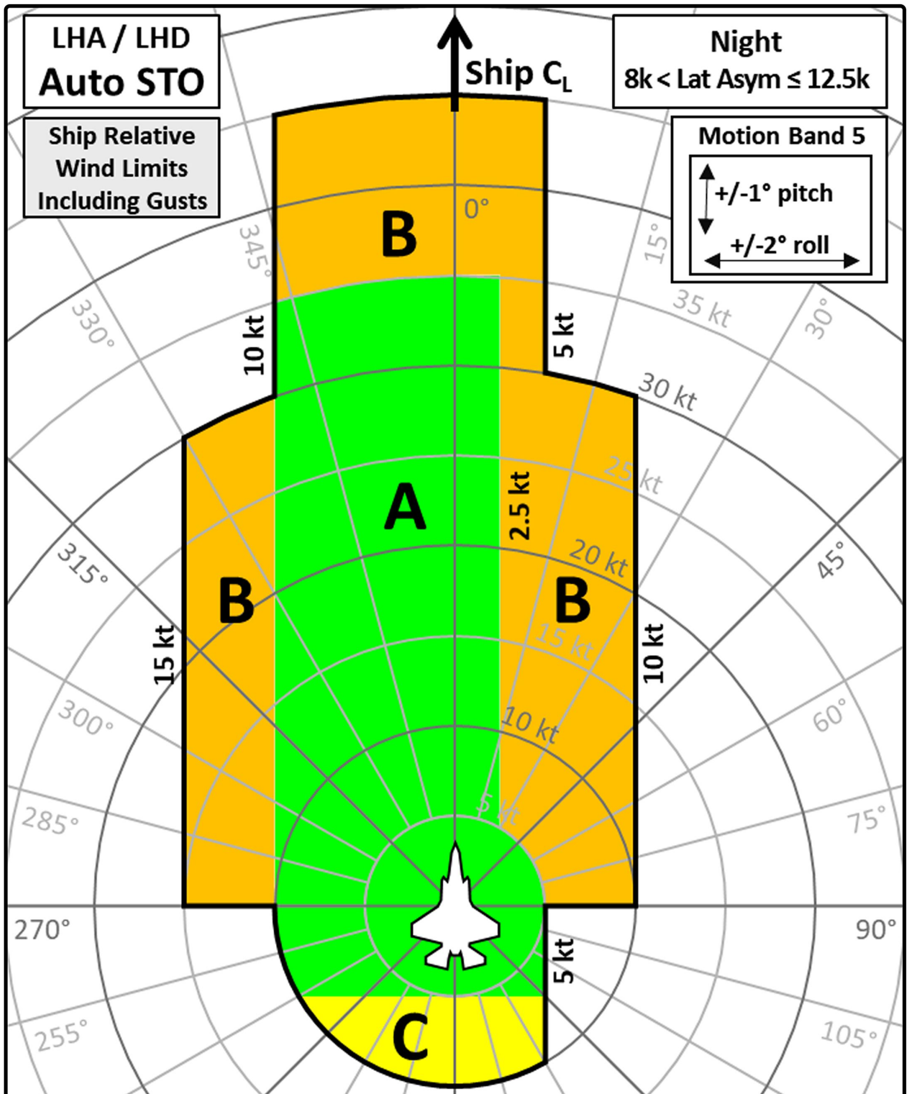



| Max Deck Motion Band | Max Ship Deck Roll Angle | Max Ship Deck Pitch Angle | |
|---|---|---|---|
| | | Bow Down | Bow Up |
| Band 4 | ± 3.5° | -1.5° | +1.5° |

NOTES:

1. Wind Regions are alphabetized according to performance capabilities from most performance (Region A) to least performance (Region C). Performance shall be calculated using the least-performance-wind-region coincident with the operating winds including excursions. Performance capability from a lesser alphabetical region can safely be used in a greater alphabetical region. Performance capability from a greater alphabetical region cannot be safely used in a lesser alphabetical region.

Figure A-61. Auto STO Night 8k < Lat Asym ≤ 12.5k Motion Band 5

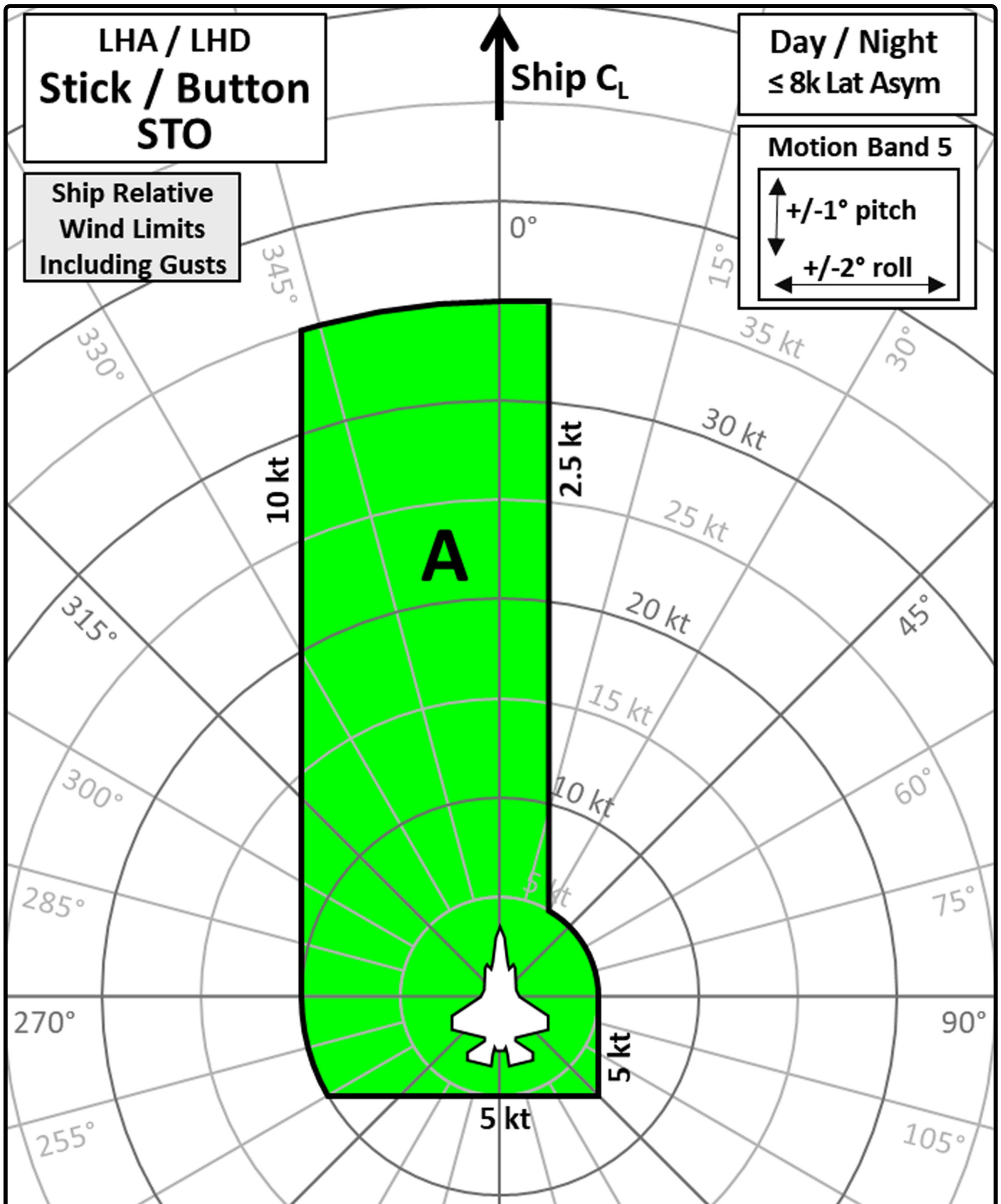



| Max Deck Motion Band | Max Ship Deck Roll Angle | Max Ship Deck Pitch Angle | |
|---|---|---|---|
| | | Bow Down | Bow Up |
| Band 5 | ± 2.0° | -1.0° | +1.0° |

NOTES:

1. Wind Regions are alphabetized according to performance capabilities from most performance (Region A) to least performance (Region C). Performance shall be calculated using the least-performance-wind-region coincident with the operating winds including excursions. Performance capability from a lesser alphabetical region can safely be used in a greater alphabetical region. Performance capability from a greater alphabetical region cannot be safely used in a lesser alphabetical region.

Figure A-62. Stick/Button STO Day/Night ≤ 8k Lat Asym Motion Band 5



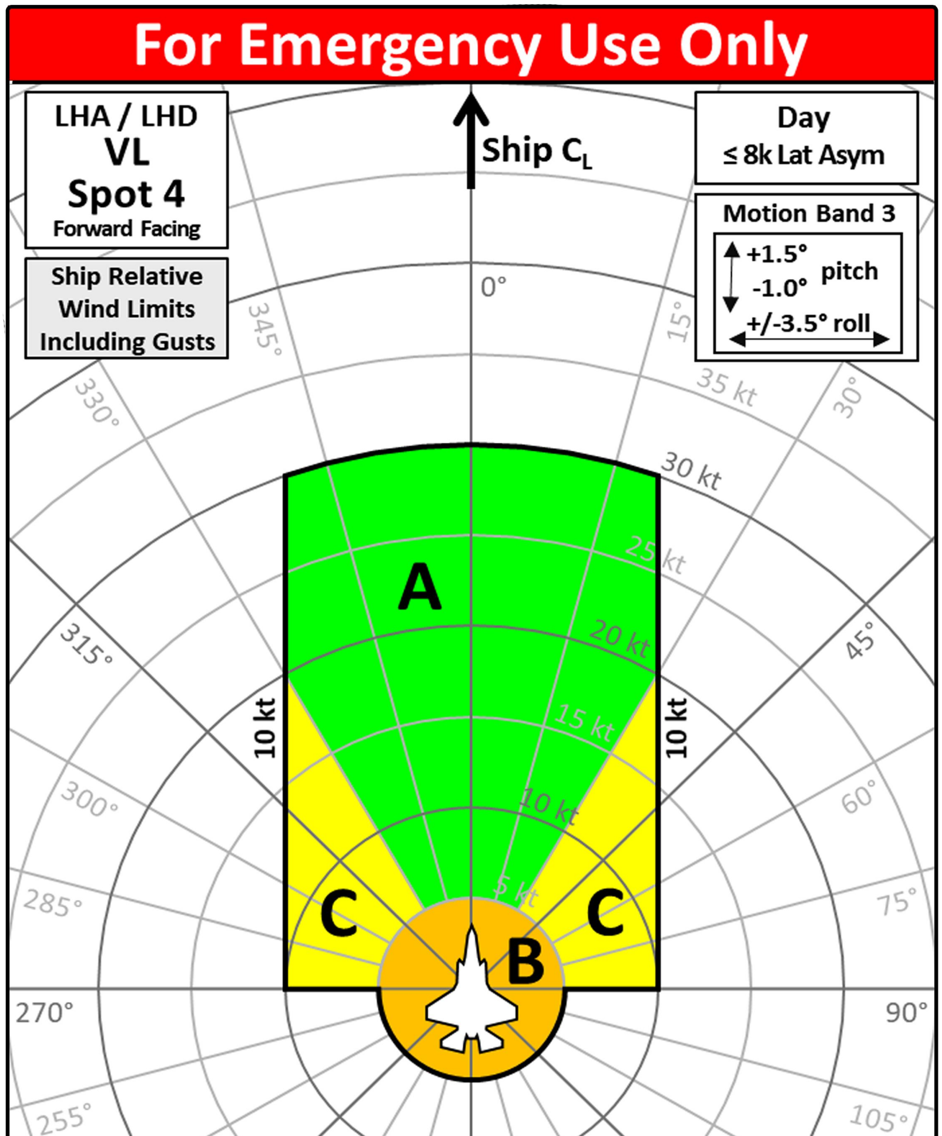

| Max Deck Motion Band | Max Ship Deck Roll Angle | Max Ship Deck Pitch Angle | |
|---|---|---|---|
| | | Bow Down | Bow Up |
| Band 5 | ± 2.0° | -1.0° | +1.0° |

Figure A-63. STOVL LHA/LHD Ship-based Forward-Facing Vertical-Landing (VL) Ship Relative Wind Motion Limitations

| DAY/ NIGHT | VL DECK SPOT (1) | ABSOLUTE LAT ASYM (FT-LB) | MAX SHIP DECK ANGLE (2) | | | MAX DECK MOTION BAND | FIGURE NUMBER |
|---|---|---|---|---|---|---|---|
| | | | ROLL ANGLE | PITCH ANGLE | | | |
| | | | | BOW DOWN | BOW UP | | |
| Day | 4 | ≤8k | ±3.5° | -1.0° | +1.5° | Band 3 | Figure A-64 |
| | | | | -1.5° | +1.5° | Band 4 | Figure A-65 |
| | 5 | ≤8k | ±3.5° | -1.0° | +1.5° | Band 3 | Figure A-66 |
| | | | | -1.5° | +1.5° | Band 4 | Figure A-67 |
| | 6 | ≤8k | ±3.5° | -1.0° | +1.5° | Band 3 | Figure A-68 |
| | | | | -1.5° | +1.5° | Band 4 | Figure A-69 |
| | 7 | ≤8k | ±5.0° | -1.0° | +2.0° | Band 1 | Figure A-70 |
| | | | | -2.0° | +2.0° | Band 2 | Figure A-71 |
| | 9 | ≤8k | ±5.0° | -1.0° | +2.0° | Band 1 | Figure A-72 |
| | | | | -2.0° | +2.0° | Band 2 | Figure A-73 |
| Night | 7 Aided / Unaided | ≤8k | ±3.5° | -1.0° | +1.5° | Band 3 | Figure A-74 |
| | | | | -1.5° | +1.5° | Band 4 | Figure A-75 |
| | 9 Aided Only | ≤8k | ±3.5° | -1.0° | +1.5° | Band 3 | Figure A-76 |
| | | | | -1.5° | +1.5° | Band 4 | Figure A-77 |
| Day | 4 | 8k to 12.5k | ± 2.0° | -1.0° | +1.0° | Band 5 | Figure A-78 |
| | 7 | 8k to 12.5k | ± 3.5° | -1.5° | +1.5° | Band 4 | Figure A-79 |
| | | 8k to 12.5k | ± 2.0° | -1.0° | +1.0° | Band 5 | Figure A-80 |
| | 9 | 8k to 12.5k | ± 3.5° | -1.5° | +1.5° | Band 4 | Figure A-81 |
| | | 8k to 12.5k | ± 2.0° | -1.0° | +1.0° | Band 5 | Figure A-82 |
| Night | 7 Aided / UnAided | 8k to 12.5k | ± 2.0° | -1.0° | +1.0° | Band 5 | Figure A-83 |
| | 9 Aided Only | 8k to 12.5k | ± 2.0° | -1.0° | +1.0° | Band 5 | Figure A-84 |

NOTES:
1. The aircraft heading is assumed to be nominally the same as the ship's Base Recovery Course (BRC).
2. Ship deck pitch and roll angles are absolute. Max angles include both trim and motion.

Figure A-64. Spot 4 Day ≤ 8k Lat Asym Motion Band 3



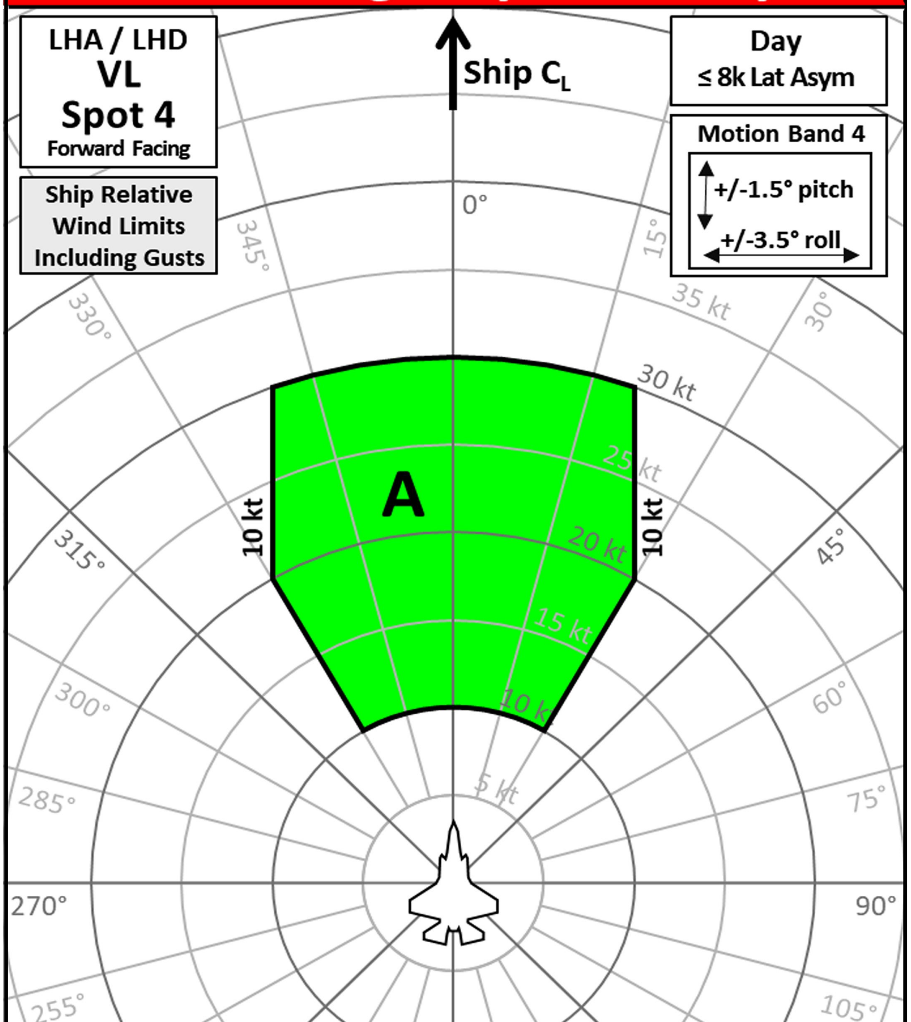

| Max Deck Motion Band | Max Ship Deck Roll Angle | Max Ship Deck Pitch Angle | |
|---|---|---|---|
| | | Bow Down | Bow Up |
| Band 3 | ± 3.5° | -1.0° | +1.5° |

NOTES:

1. Target alignment: Pilot eye at the intersection of the Tramline and Spot 4 athwartship line.
2. Wind Regions are alphabetized according to performance capabilities from most performance (Region A) to least performance (Region C). Performance shall be calculated using the least-performance-wind-region coincident with the operating winds including excursions. Performance capability from a lesser alphabetical region can safely be used in a greater alphabetical region. Performance capability from a greater alphabetical region cannot be safely used in a lesser alphabetical region.

Figure A-65. Spot 4 Day ≤ 8k Lat Asym Motion Band 4

For Emergency Use Only

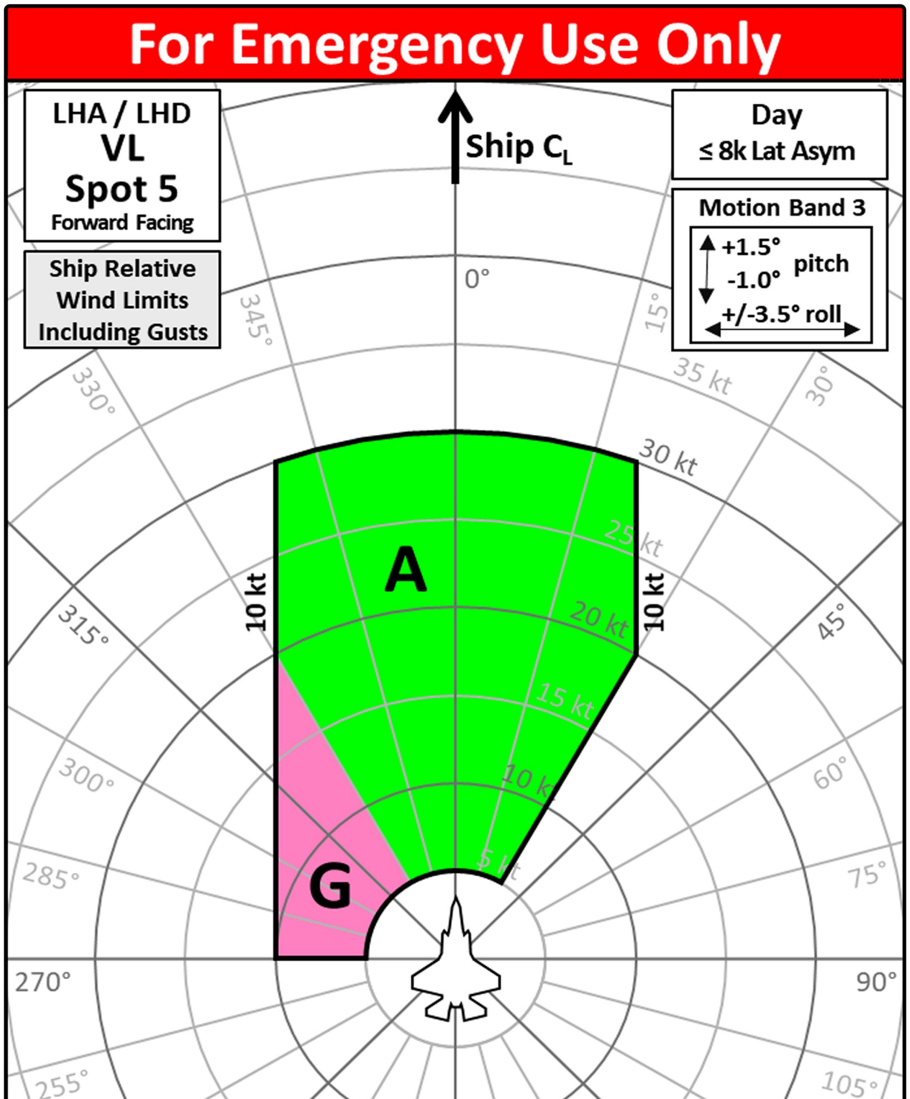



| Max Deck Motion Band | Max Ship Deck Roll Angle | Max Ship Deck Pitch Angle | |
|---|---|---|---|
| | | Bow Down | Bow Up |
| Band 4 | ± 3.5° | -1.5° | +1.5° |

NOTES:

1. Target alignment: Pilot eye at the intersection of the Tramline and Spot 4 athwartship line.

Figure A-66. Spot 5 Day ≤ 8k Lat Asym Motion Band 3

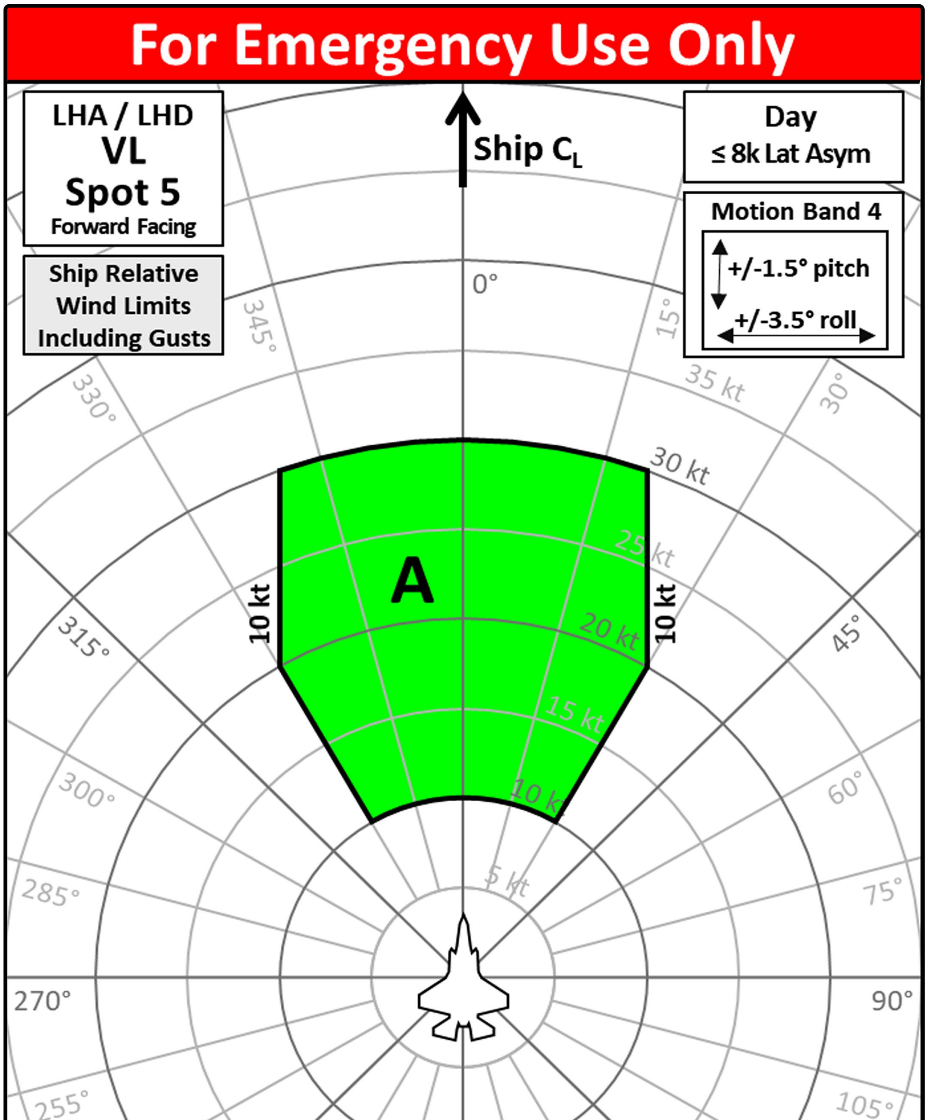



| Max Deck Motion Band | Max Ship Deck Roll Angle | Max Ship Deck Pitch Angle | |
|---|---|---|---|
| | | Bow Down | Bow Up |
| Band 3 | ± 3.5° | -1.0° | +1.5° |

NOTES:

1. Target alignment: Pilot eye at the intersection of the Tramline and Spot 5 athwartship line.
2. Wind Regions are alphabetized according to performance capabilities from most performance (Region A) to least performance (Region G). Performance shall be calculated using the least-performance-wind-region coincident with the operating winds including excursions. Performance capability from a lesser alphabetical region can safely be used in a greater alphabetical region. Performance capability from a greater alphabetical region cannot be safely used in a lesser alphabetical region.

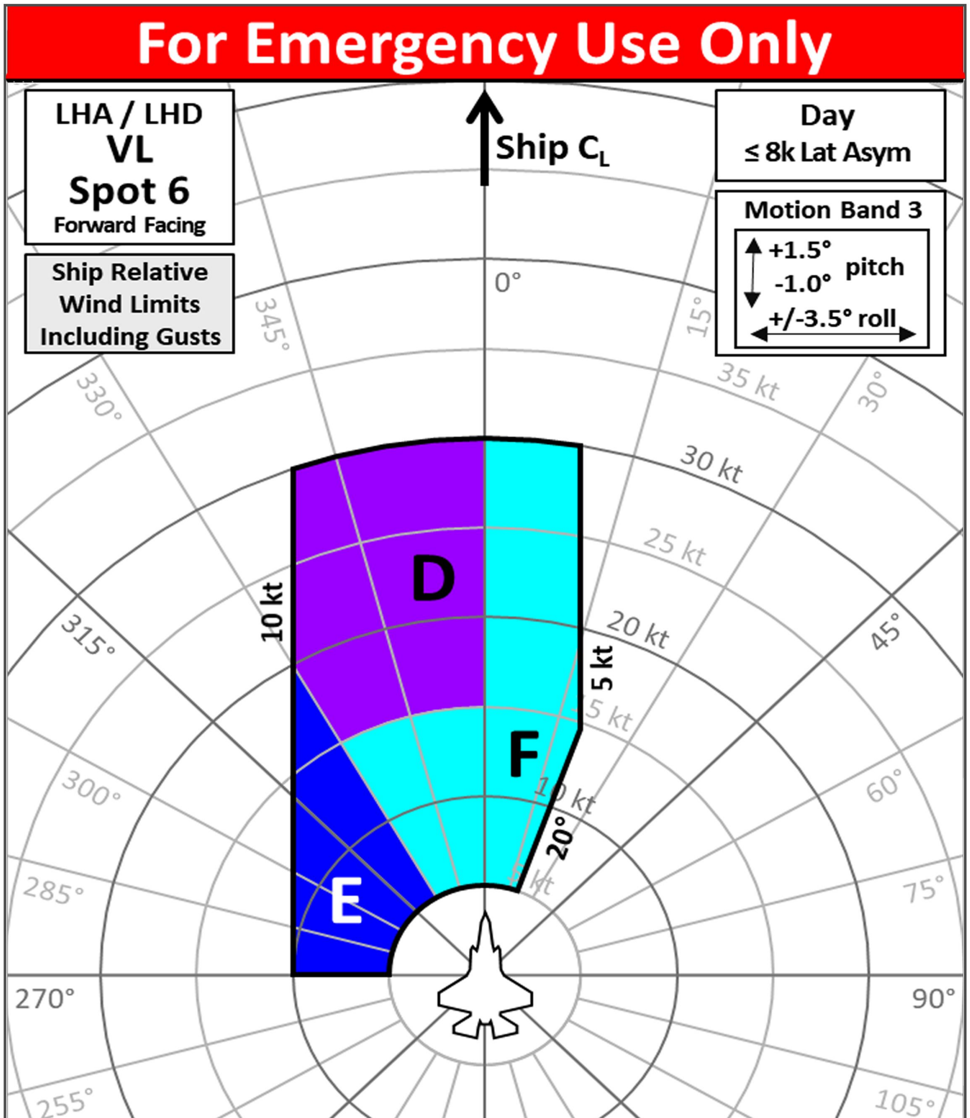
Figure A-67. Spot 5 Day ≤ 8k Lat Asym Motion Band 4




| Max Deck Motion Band | Max Ship Deck Roll Angle | Max Ship Deck Pitch Angle | |
|---|---|---|---|
| | | Bow Down | Bow Up |
| Band 4 | ± 3.5° | -1.5° | +1.5° |

NOTES:
1. Target alignment: Pilot eye at the intersection of the Tramline and Spot 5 athwartship line.

Figure A-68. Spot 6 Day ≤ 8k Lat Asym Motion Band 3

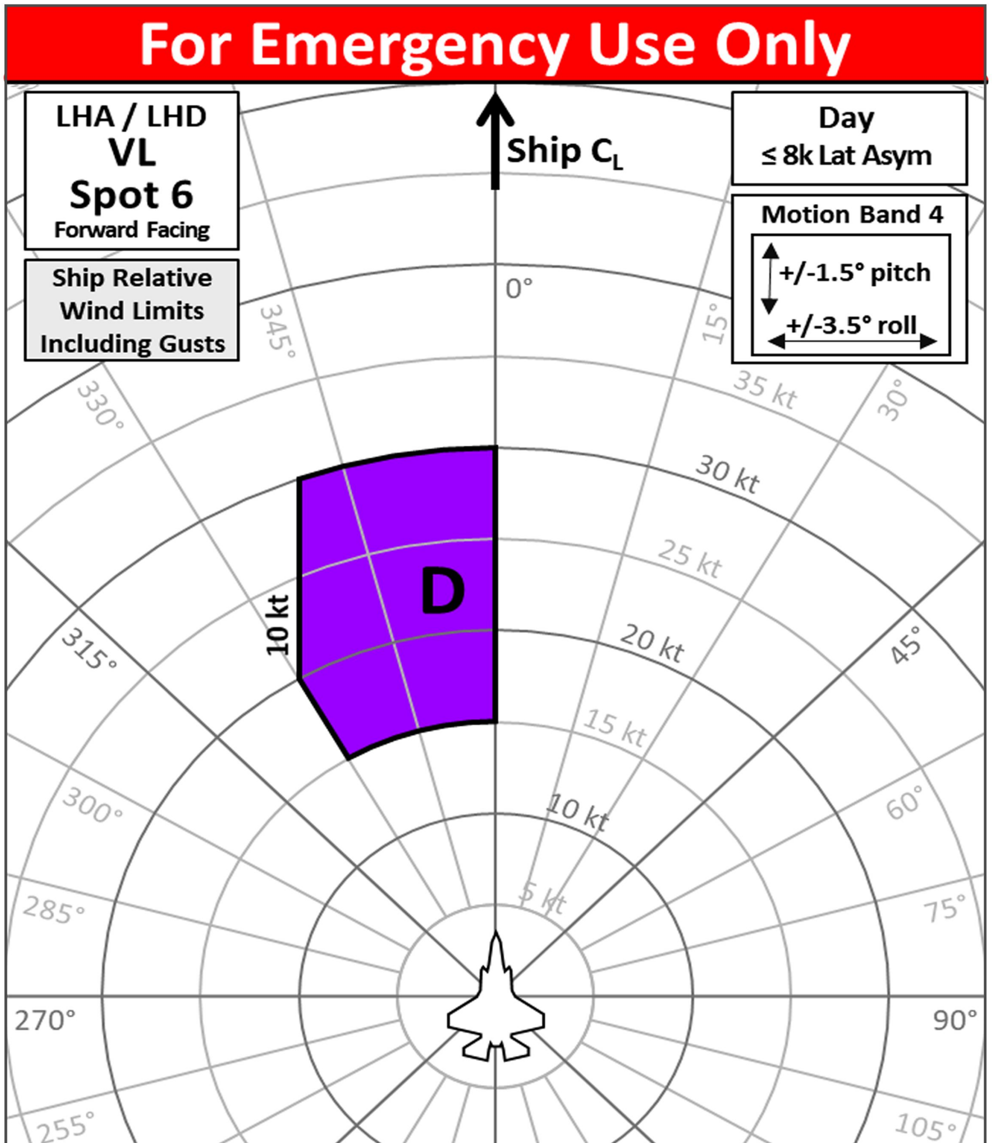



| Max Deck Motion Band | Max Ship Deck Roll Angle | Max Ship Deck Pitch Angle | |
|---|---|---|---|
| | | Bow Down | Bow Up |
| Band 3 | ± 3.5° | -1.0° | +1.5° |

NOTES:

1. Target alignment: Pilot eye at the intersection of the Tramline and Spot 6 athwartship line.
2. Wind Regions are alphabetized according to performance capabilities from most performance (Region D) to least performance (Region F). Performance shall be calculated using the least-performance-wind-region coincident with the operating winds including excursions. Performance capability from a lesser alphabetical region can safely be used in a greater alphabetical region. Performance capability from a greater alphabetical region cannot be safely used in a lesser alphabetical region.

Figure A-69. Spot 6 Day ≤ 8k Lat Asym Motion Band 4

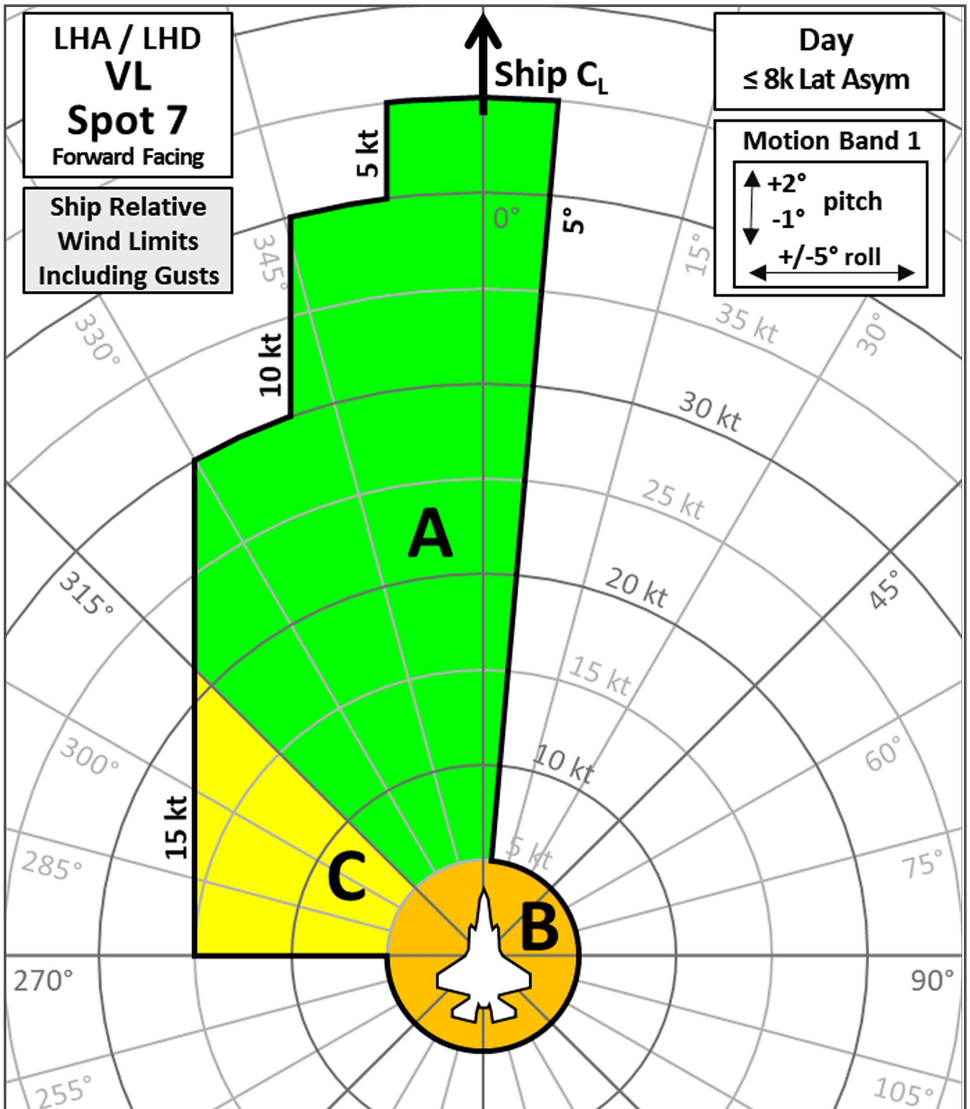



| Max Deck Motion Band | Max Ship Deck Roll Angle | Max Ship Deck Pitch Angle | |
|---|---|---|---|
| | | Bow Down | Bow Up |
| Band 4 | ± 3.5° | -1.5° | +1.5° |

NOTES:

1. Target alignment: Pilot eye at the intersection of the Tramline and Spot 6 athwartship line.

Figure A-70. Spot 7 Day ≤ 8k Lat Asym Motion Band 1

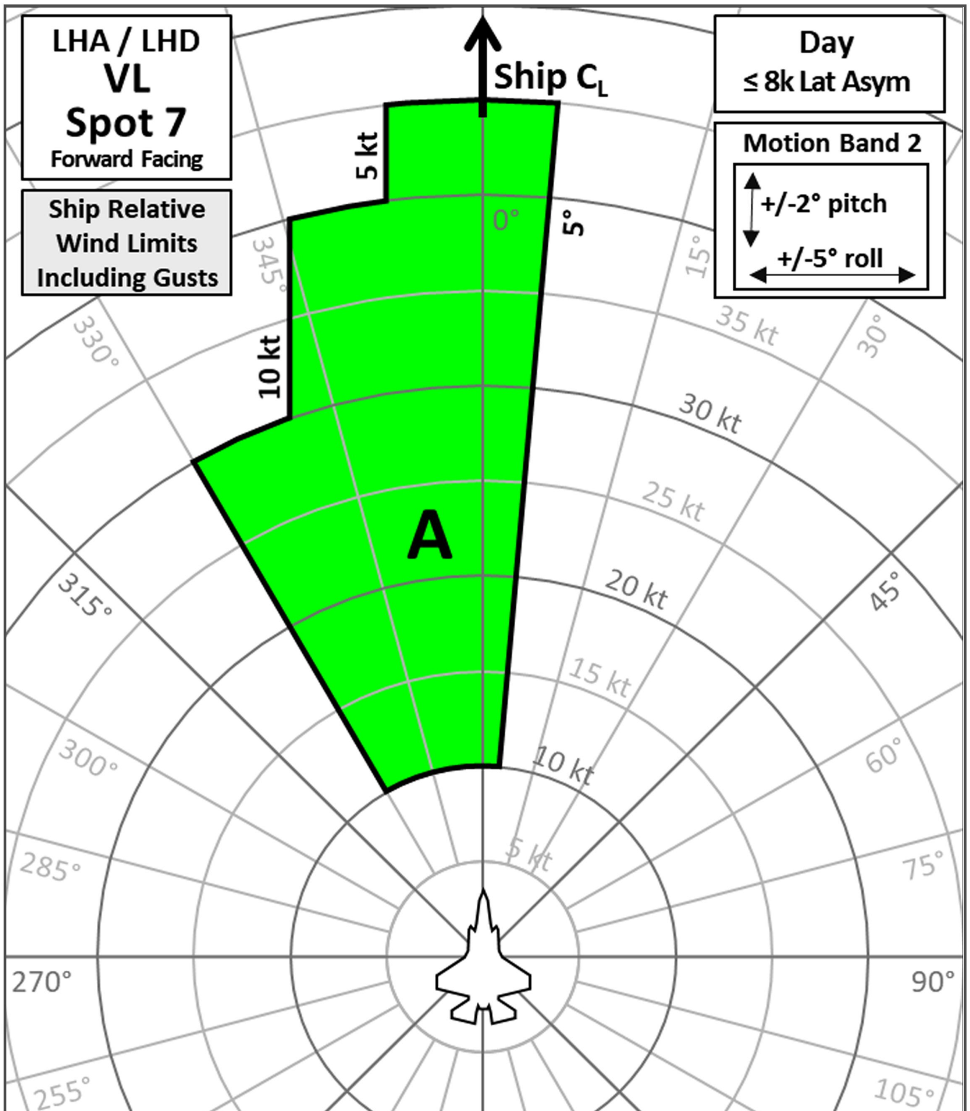



| Max Deck Motion Band | Max Ship Deck Roll Angle | Max Ship Deck Pitch Angle | |
|---|---|---|---|
| | | Bow Down | Bow Up |
| Band 1 | ± 5.0° | -1.0° | +2.0° |

NOTES:

1. Target alignment: Pilot eye at the intersection of the Tramline and Spot 7 athwartship line.
2. Wind Regions are alphabetized according to performance capabilities from most performance (Region A) to least performance (Region C). Performance shall be calculated using the least-performance-wind-region coincident with the operating winds including excursions. Performance capability from a lesser alphabetical region can safely be used in a greater alphabetical region. Performance capability from a greater alphabetical region cannot be safely used in a lesser alphabetical region.

Figure A-71. Spot 7 Day ≤ 8k Lat Asym Motion Band 2

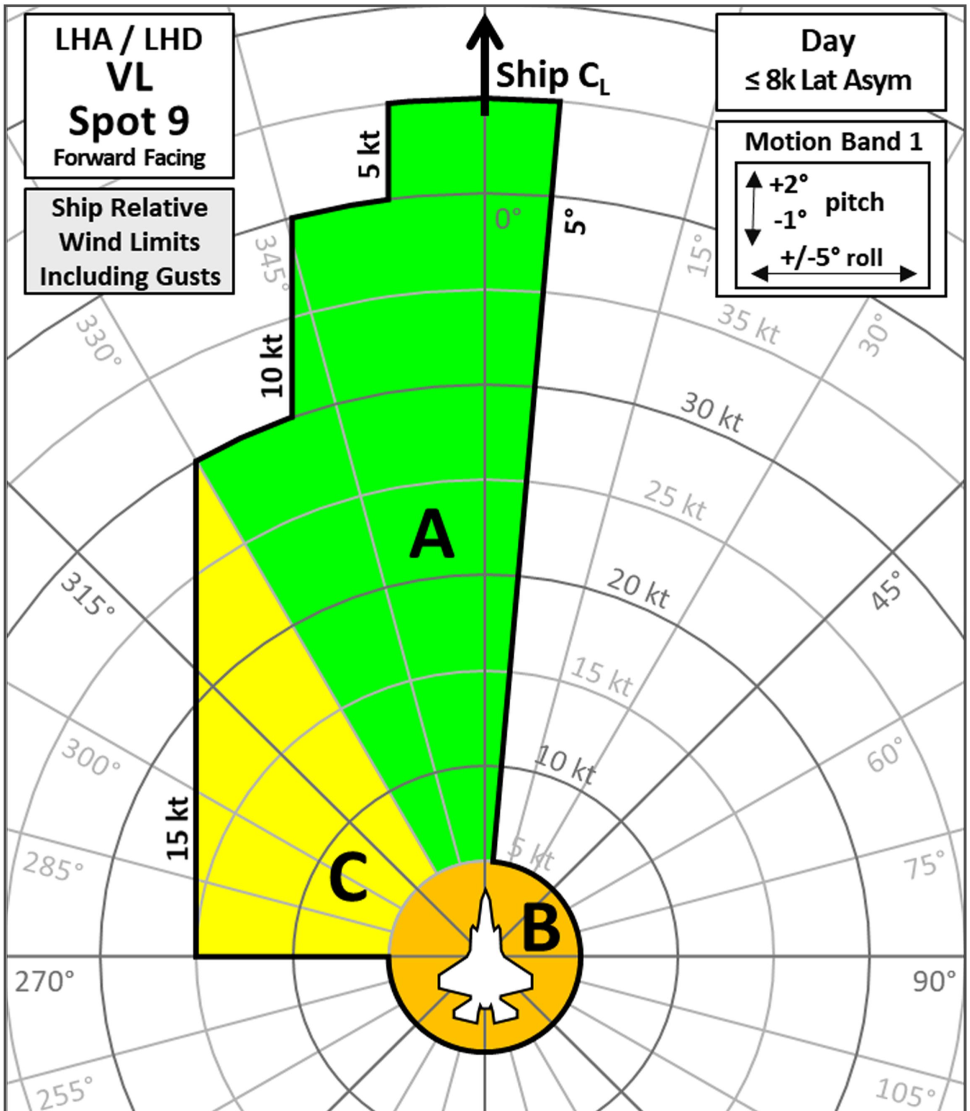



| Max Deck Motion Band | Max Ship Deck Roll Angle | Max Ship Deck Pitch Angle | |
|---|---|---|---|
| | | Bow Down | Bow Up |
| Band 2 | ± 5.0° | -2.0° | +2.0° |

NOTES:

1. Target alignment: Pilot eye at the intersection of the Tramline and Spot 7 athwartship line.

Figure A-72. Spot 9 Day ≤ 8k Lat Asym Motion Band 1

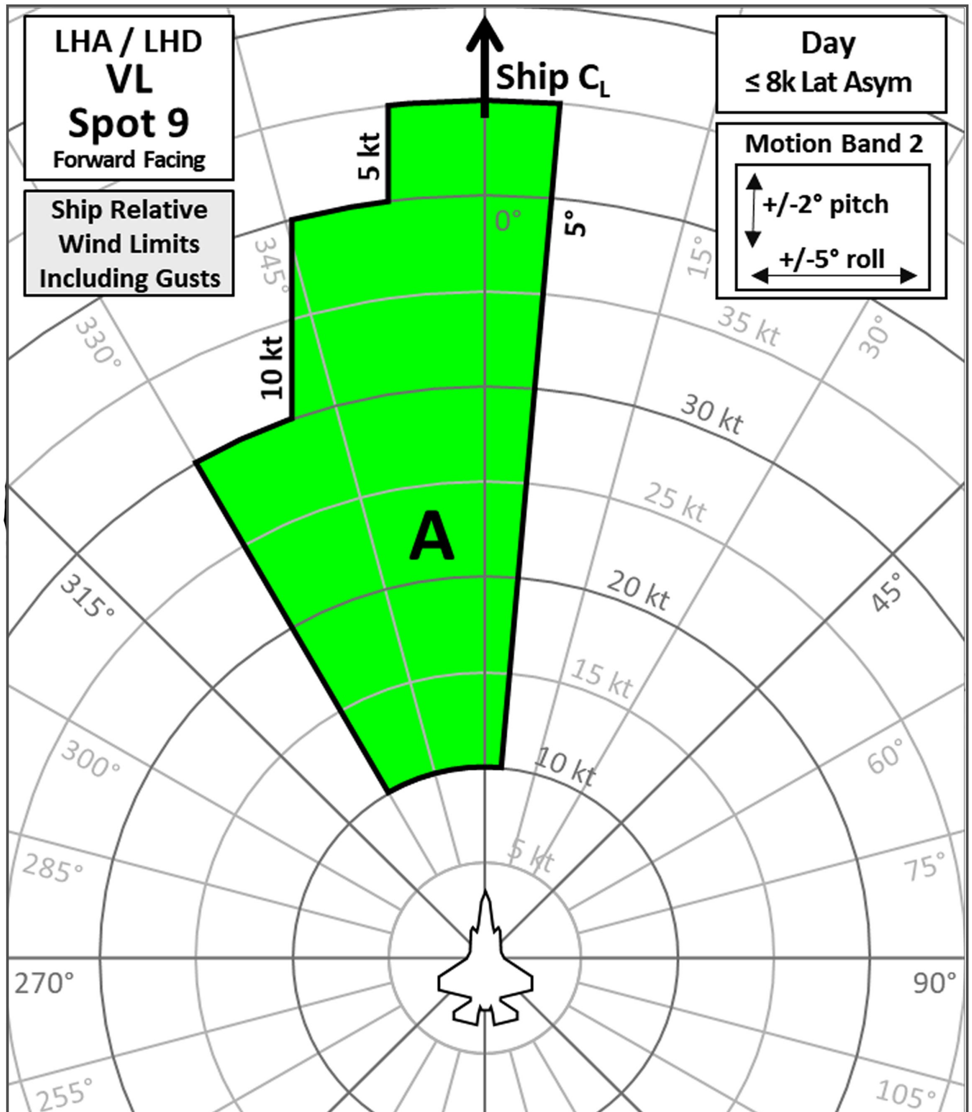



| Max Deck Motion Band | Max Ship Deck Roll Angle | Max Ship Deck Pitch Angle | |
|---|---|---|---|
| | | Bow Down | Bow Up |
| Band 1 | ± 5.0° | -1.0° | +2.0° |

NOTES:

1. Target alignment: Pilot eye at the intersection of the Tramline and Spot 9 athwartship line.
2. Wind Regions are alphabetized according to performance capabilities from most performance (Region A) to least performance (Region C). Performance shall be calculated using the least-performance-wind-region coincident with the operating winds including excursions. Performance capability from a lesser alphabetical region can safely be used in a greater alphabetical region. Performance capability from a greater alphabetical region cannot be safely used in a lesser alphabetical region.

Figure A-73. Spot 9 Day ≤ 8k Lat Asym Motion Band 2

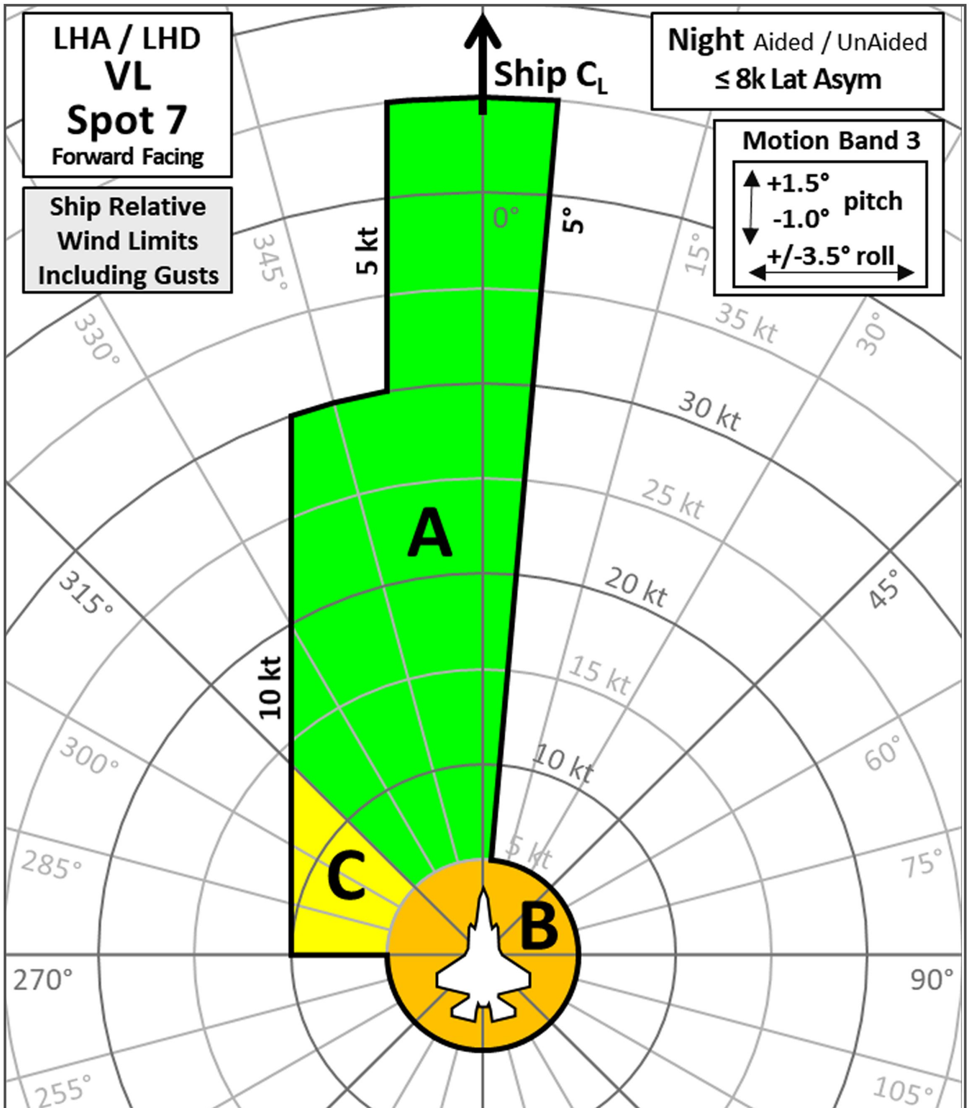



| Max Deck Motion Band | Max Ship Deck Roll Angle | Max Ship Deck Pitch Angle | |
|---|---|---|---|
| | | Bow Down | Bow Up |
| Band 2 | ± 5.0° | -2.0° | +2.0° |

NOTES:

1. Target alignment: Pilot eye at the intersection of the Tramline and Spot 9 athwartship line.

Figure A-74. Spot 7 Aided/Unaided Night ≤ 8k Lat Asym Motion Band 3

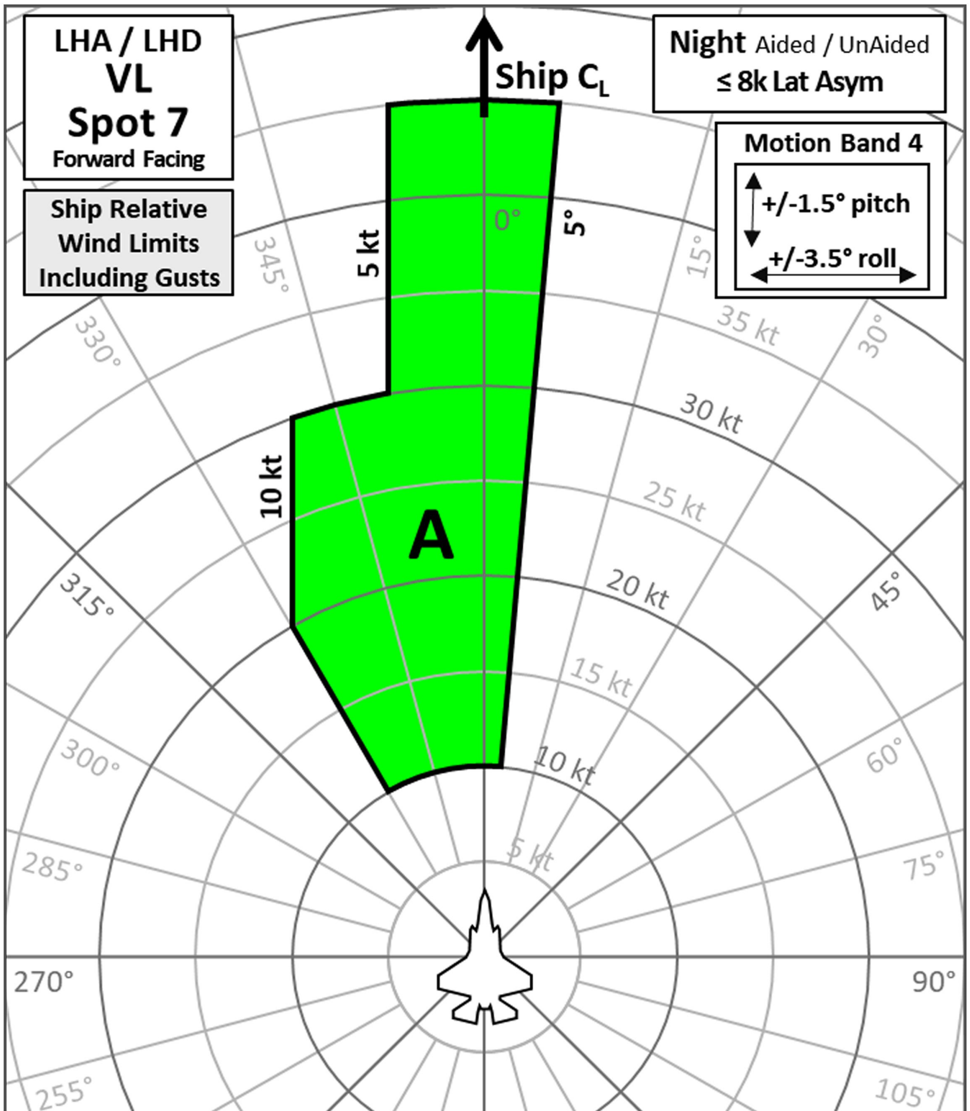



| Max Deck Motion Band | Max Ship Deck Roll Angle | Max Ship Deck Pitch Angle | |
|---|---|---|---|
| | | Bow Down | Bow Up |
| Band 3 | ± 3.5° | -1.0° | +1.5° |

NOTES:

1. Target alignment: Pilot eye at the intersection of the Tramline and Spot 7 athwartship line.
2. Wind Regions are alphabetized according to performance capabilities from most performance (Region A) to least performance (Region C). Performance shall be calculated using the least-performance-wind-region coincident with the operating winds including excursions. Performance capability from a lesser alphabetical region can safely be used in a greater alphabetical region. Performance capability from a greater alphabetical region cannot be safely used in a lesser alphabetical region.

Figure A-75. Spot 7 Aided/Unaided Night ≤ 8k Lat Asym Motion Band 4

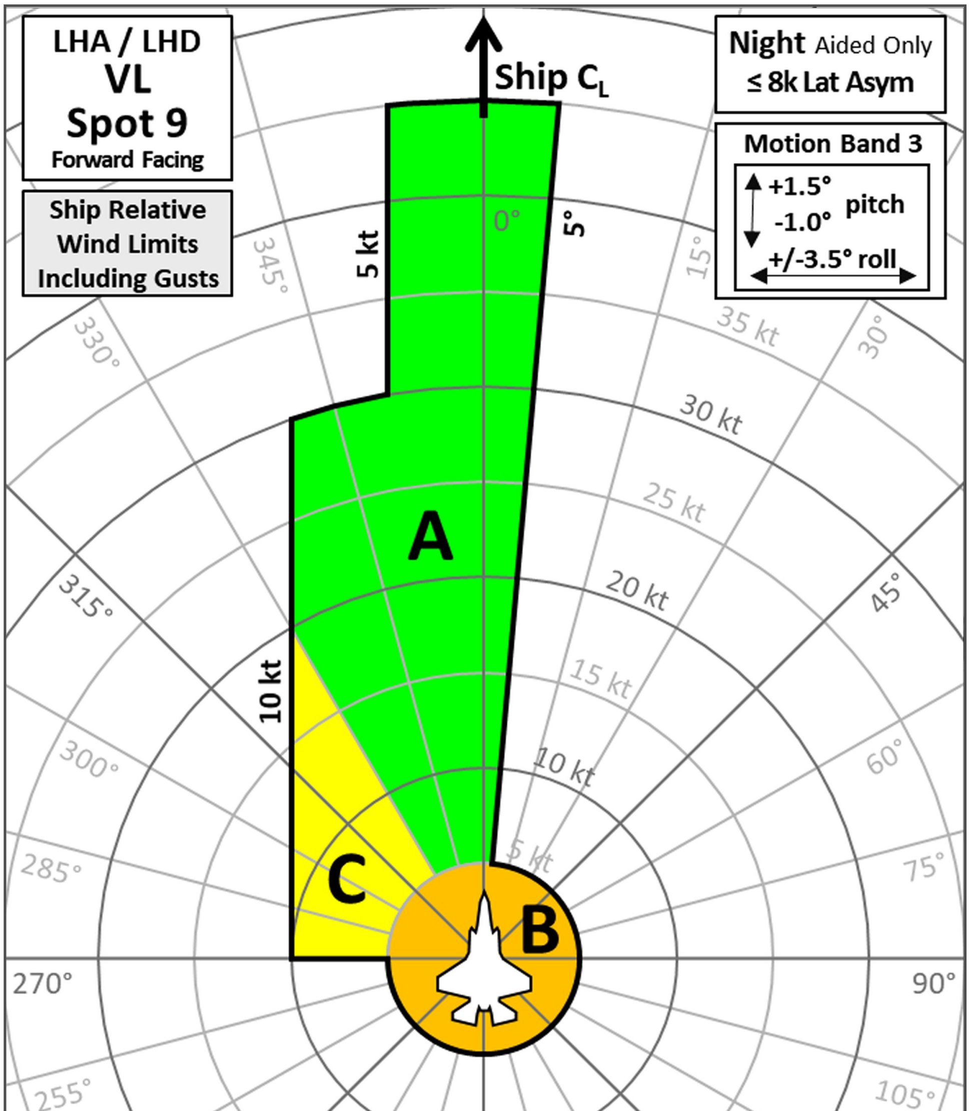



| Max Deck Motion Band | Max Ship Deck Roll Angle | Max Ship Deck Pitch Angle | |
|---|---|---|---|
| | | Bow Down | Bow Up |
| Band 4 | ± 3.5° | -1.5° | +1.5° |

NOTES:

1. Target alignment: Pilot eye at the intersection of the Tramline and Spot 7 athwartship line.

Figure A-76. Spot 9 Aided Only Night ≤ 8k Lat Asym Motion Band 3

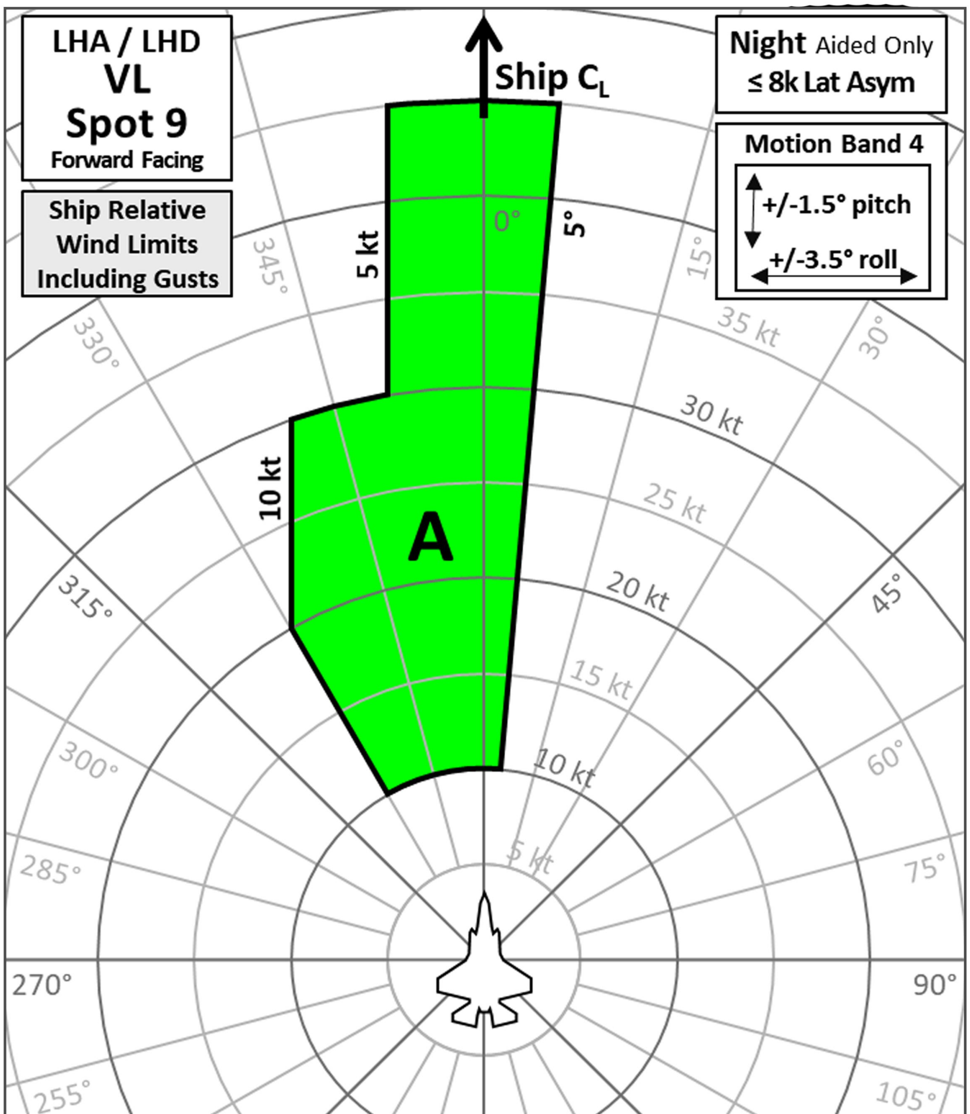



| Max Deck Motion Band | Max Ship Deck Roll Angle | Max Ship Deck Pitch Angle | |
|---|---|---|---|
| | | Bow Down | Bow Up |
| Band 3 | ± 3.5° | -1.0° | +1.5° |

NOTES:

1. Target alignment: Pilot eye at the intersection of the Tramline and Spot 9 athwartship line.
2. Wind Regions are alphabetized according to performance capabilities from most performance (Region A) to least performance (Region C). Performance shall be calculated using the least-performance-wind-region coincident with the operating winds including excursions. Performance capability from a lesser alphabetical region can safely be used in a greater alphabetical region. Performance capability from a greater alphabetical region cannot be safely used in a lesser alphabetical region.

Figure A-77. Spot 9 Aided Only Night ≤ 8k Lat Asym Motion Band 4

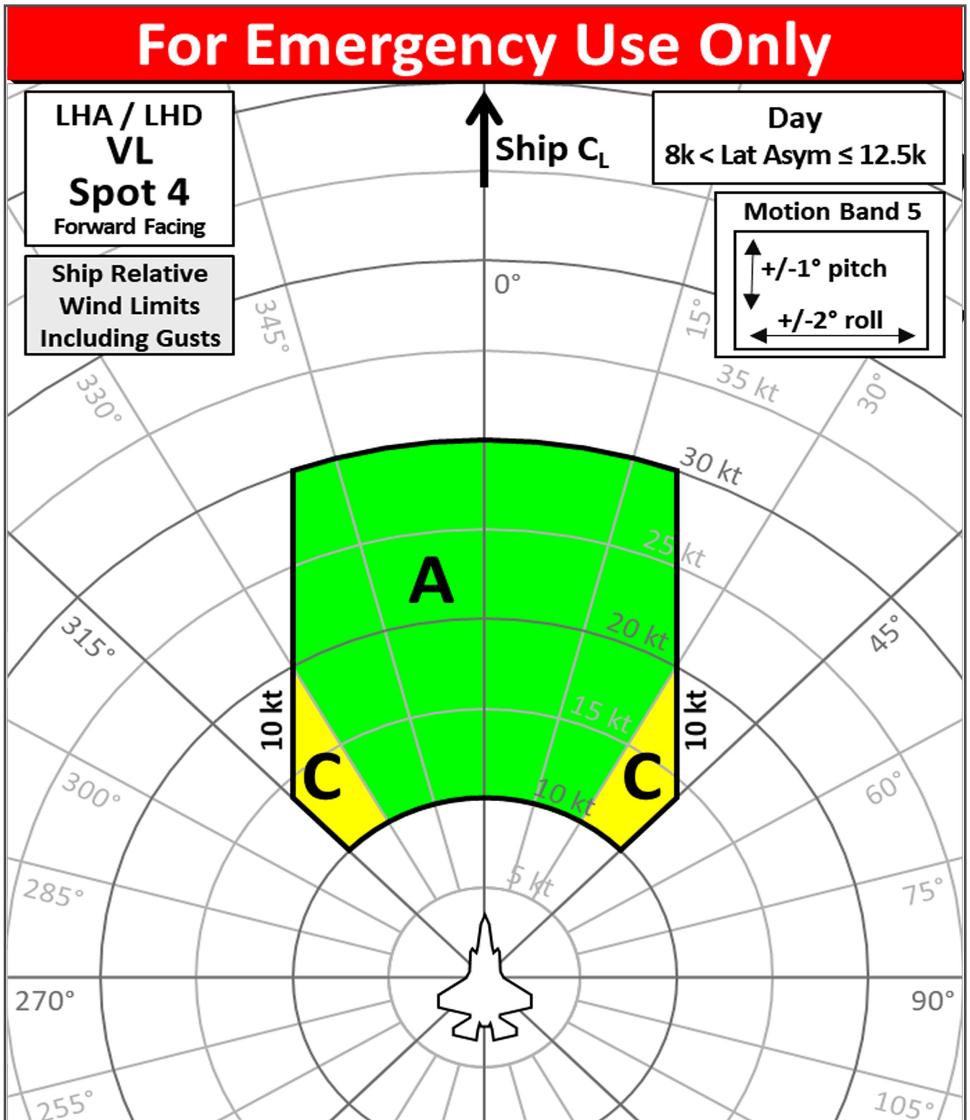



| Max Deck Motion Band | Max Ship Deck Roll Angle | Max Ship Deck Pitch Angle | |
|---|---|---|---|
| | | Bow Down | Bow Up |
| Band 4 | ± 3.5° | -1.5° | +1.5° |

NOTES:

1. Target alignment: Pilot eye at the intersection of the Tramline and Spot 9 athwartship line.

Figure A-78. Spot 4 Day 8k < Lat Asym ≤ 12.5k Motion Band 5

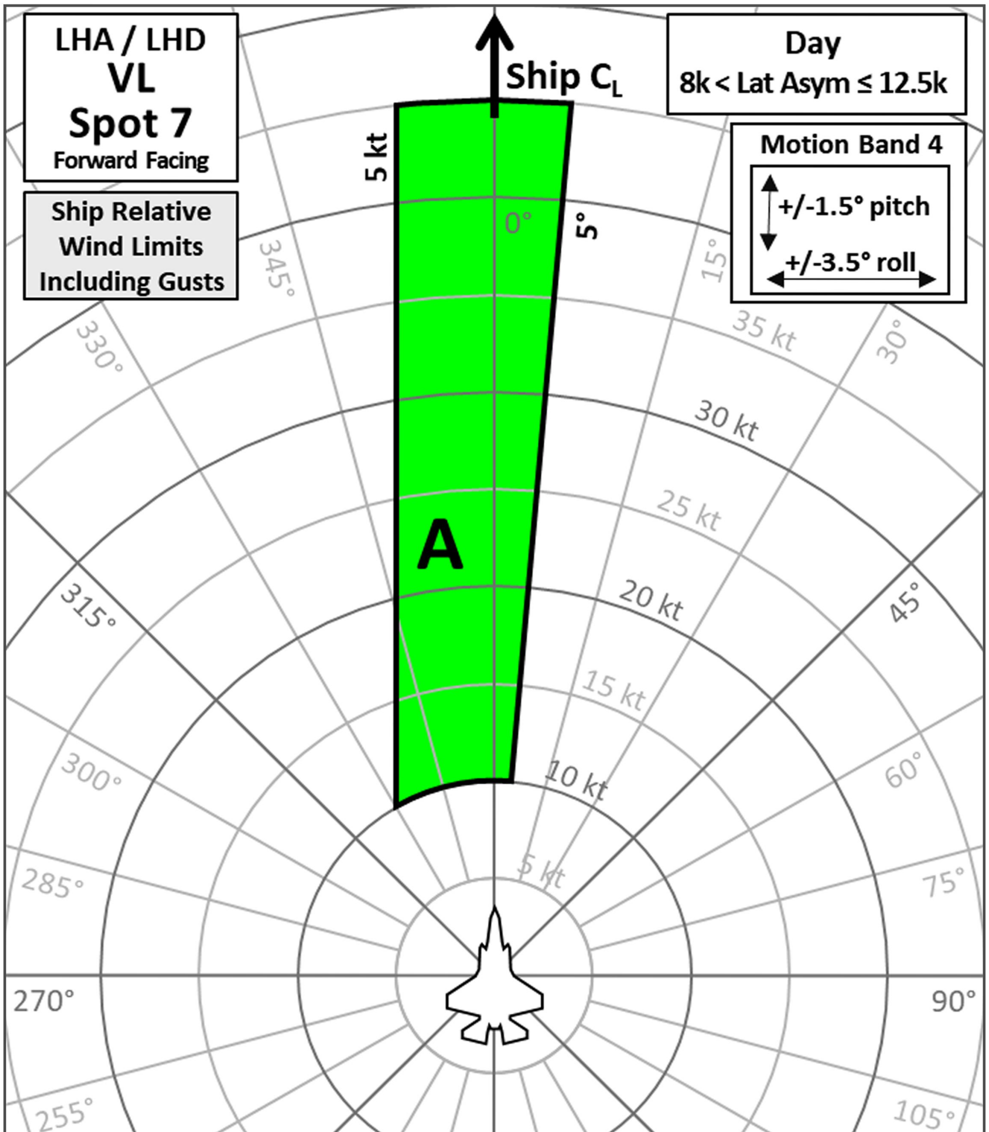



| Max Deck Motion Band | Max Ship Deck Roll Angle | Max Ship Deck Pitch Angle | |
|---|---|---|---|
| | | Bow Down | Bow Up |
| Band 5 | ± 2.0° | -1.0° | +1.0° |

NOTES:

1. Target alignment: Pilot eye at the intersection of the Tramline and Spot 4 athwartship line.
2. Wind Regions are alphabetized according to performance capabilities from most performance (Region A) to least performance (Region C). Performance shall be calculated using the least-performance-wind-region coincident with the operating winds including excursions. Performance capability from a lesser alphabetical region can safely be used in a greater alphabetical region. Performance capability from a greater alphabetical region cannot be safely used in a lesser alphabetical region.

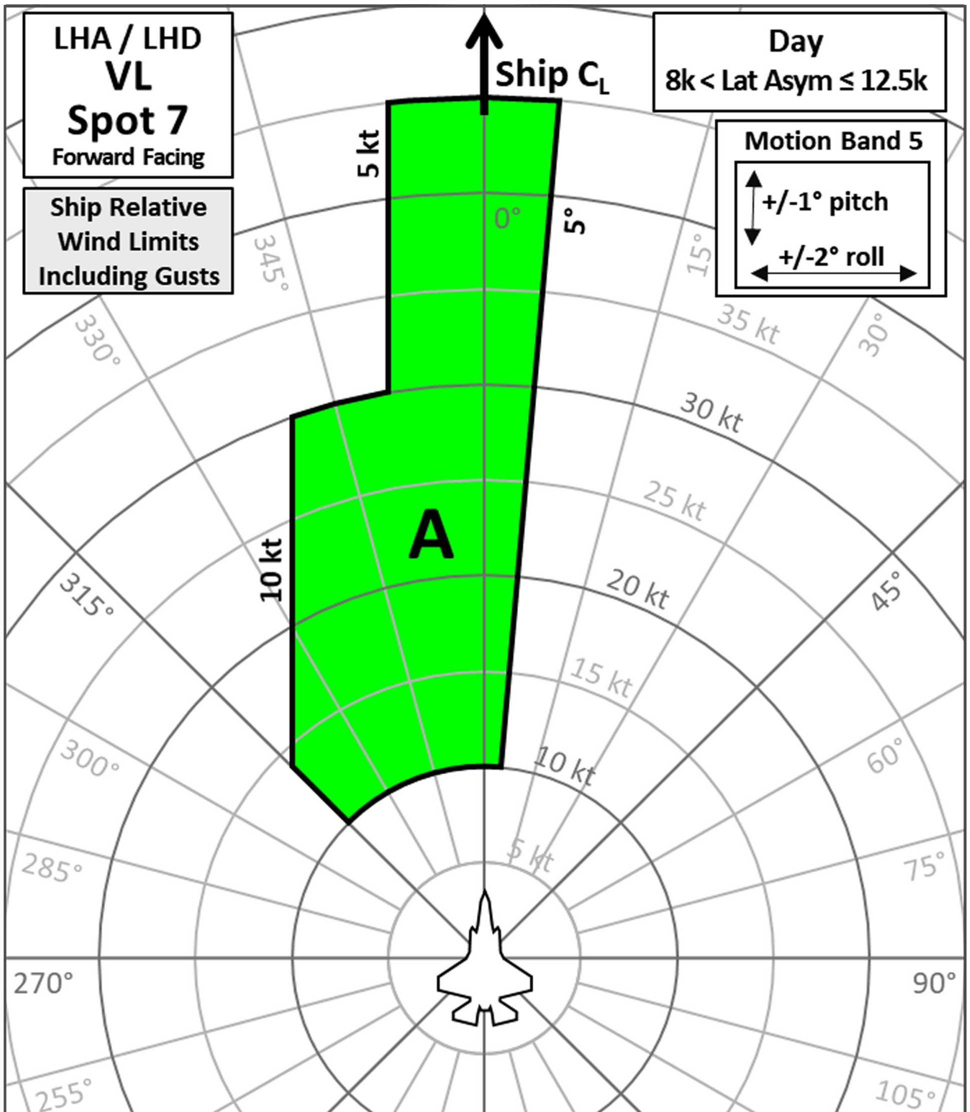
Figure A-79. Spot 7 Day 8k < Lat Asym ≤ 12.5k Motion Band 4




| Max Deck Motion Band | Max Ship Deck Roll Angle | Max Ship Deck Pitch Angle | |
|---|---|---|---|
| | | Bow Down | Bow Up |
| Band 4 | ± 3.5° | -1.5° | +1.5° |

NOTES:
1. Target alignment: Pilot eye at the intersection of the Tramline and Spot 7 athwartship line.

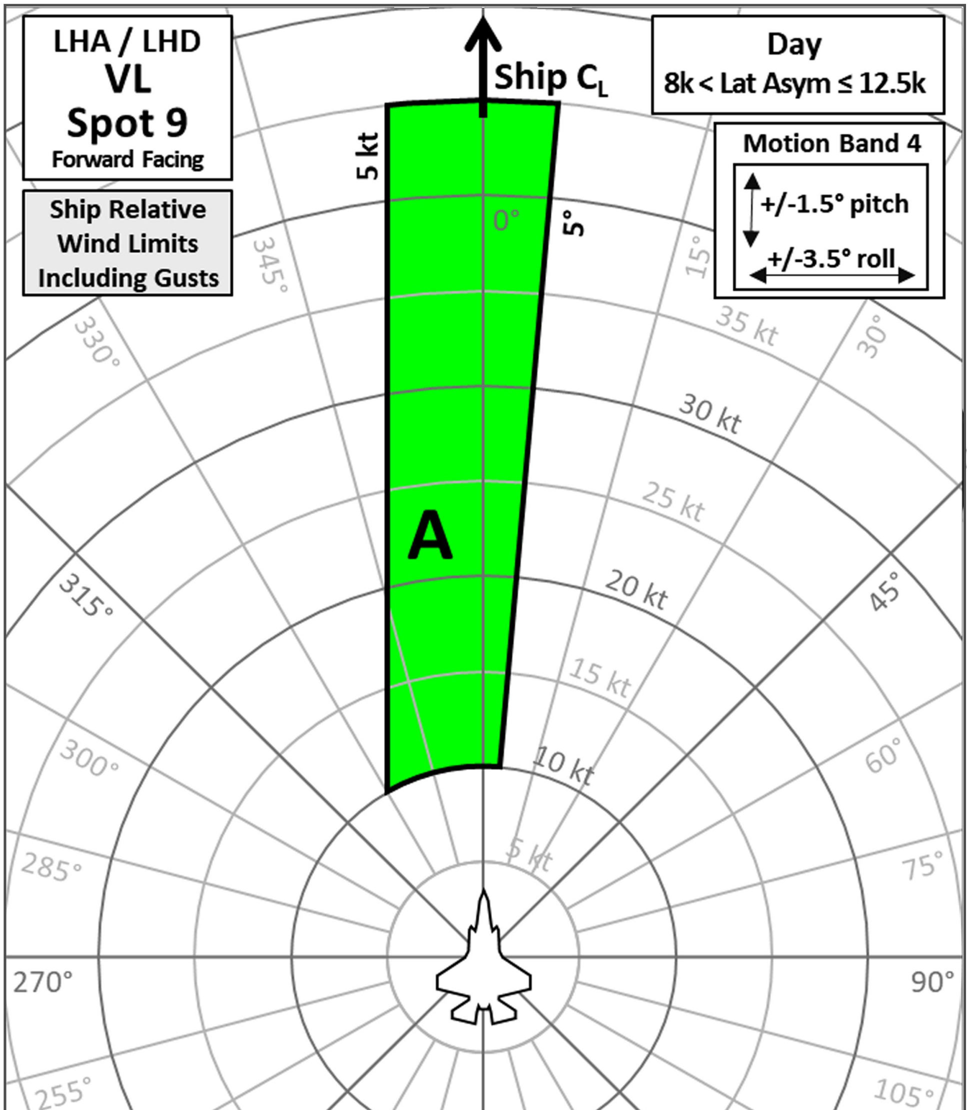
Figure A-80. Spot 7 Day 8k < Lat Asym ≤ 12.5k Motion Band 5




| Max Deck Motion Band | Max Ship Deck Roll Angle | Max Ship Deck Pitch Angle | |
|---|---|---|---|
| | | Bow Down | Bow Up |
| Band 5 | ± 2.0° | -1.0° | +1.0° |

NOTES:
1. Target alignment: Pilot eye at the intersection of the Tramline and Spot 7 athwartship line.

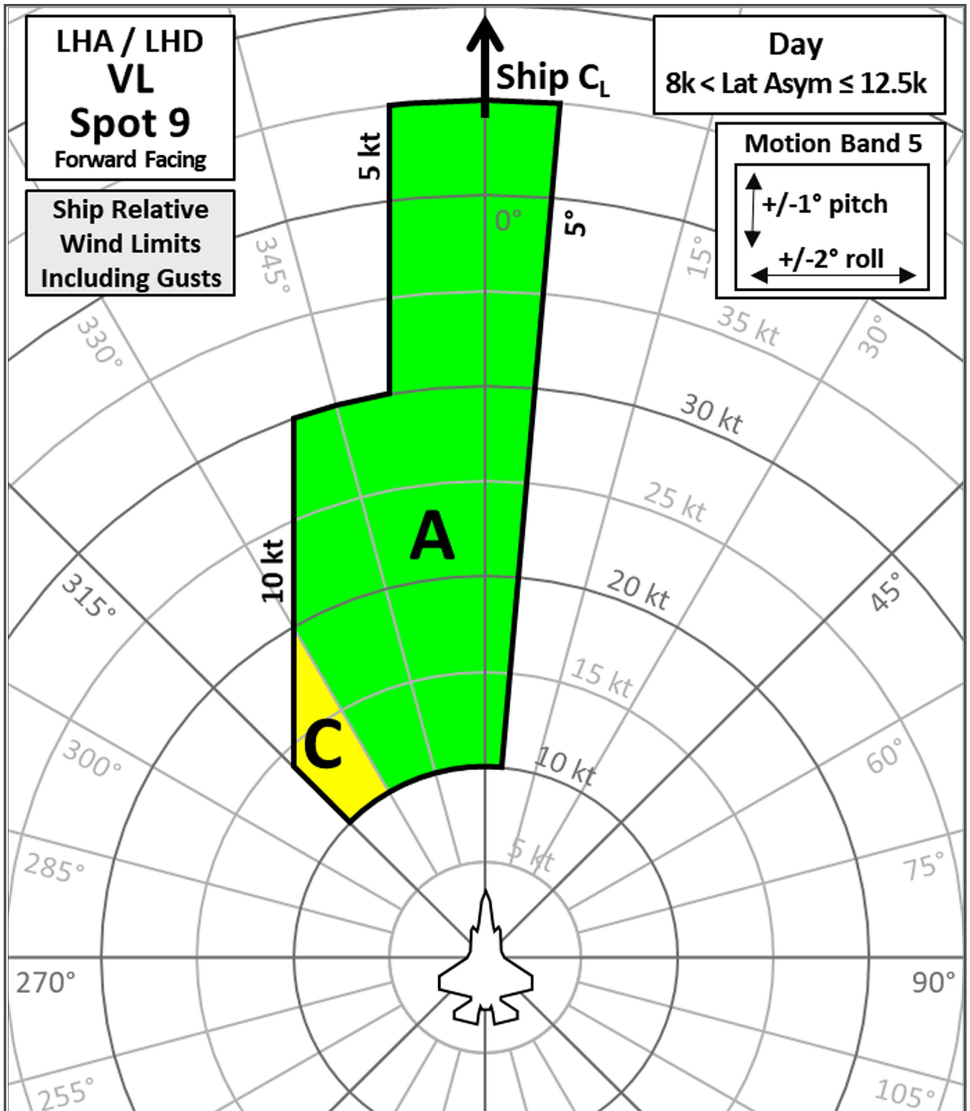
Figure A-81. Spot 9 Day 8k < Lat Asym ≤ 12.5k Motion Band 4




| Max Deck Motion Band | Max Ship Deck Roll Angle | Max Ship Deck Pitch Angle | |
|---|---|---|---|
| | | Bow Down | Bow Up |
| Band 4 | ± 3.5° | -1.5° | +1.5° |

NOTES:
1. Target alignment: Pilot eye at the intersection of the Tramline and Spot 9 athwartship line.

Figure A-82. Spot 9 Day 8k < Lat Asym ≤ 12.5k Motion Band 5

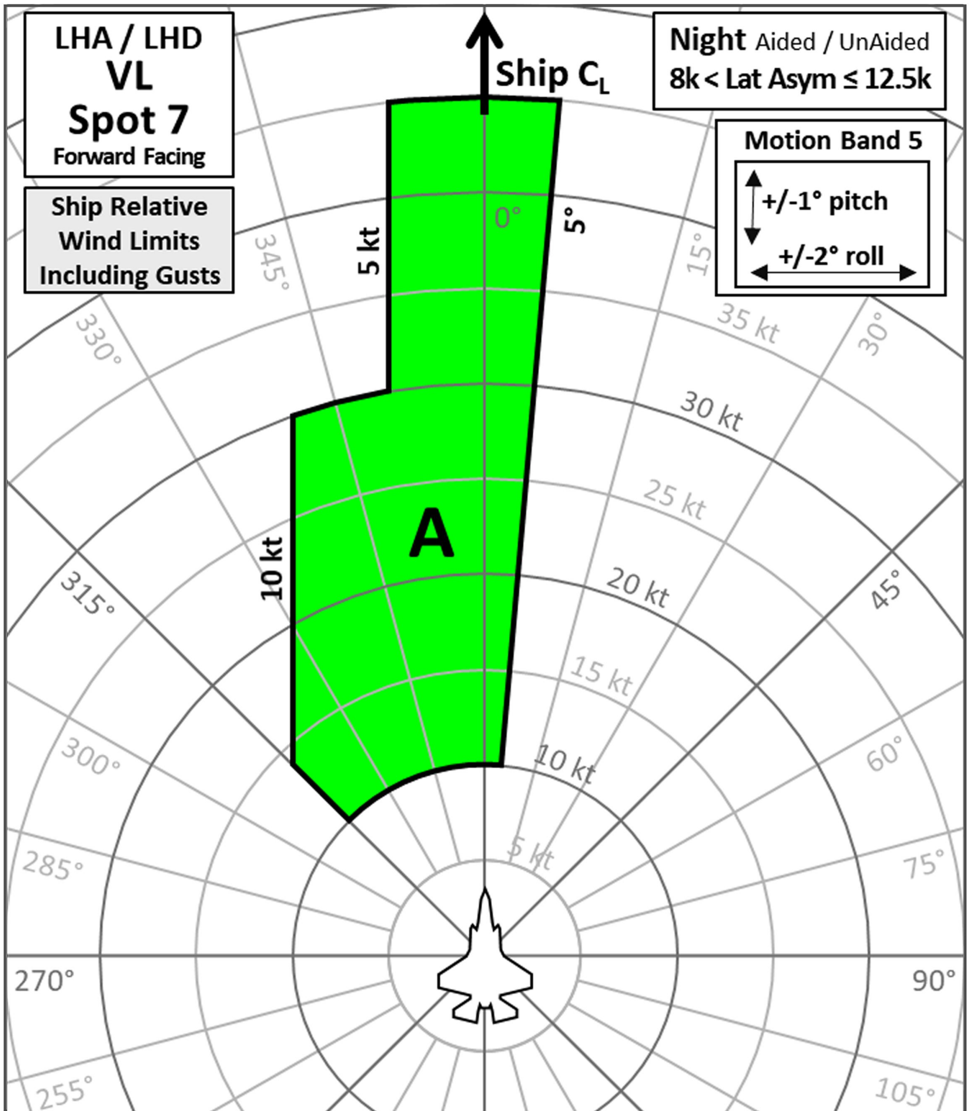



| Max Deck Motion Band | Max Ship Deck Roll Angle | Max Ship Deck Pitch Angle | |
|---|---|---|---|
| | | Bow Down | Bow Up |
| Band 5 | ± 2.0° | -1.0° | +1.0° |

NOTES:

1. Target alignment: Pilot eye at the intersection of the Tramline and Spot 9 athwartship line.
2. Wind Regions are alphabetized according to performance capabilities from most performance (Region A) to least performance (Region C). Performance shall be calculated using the least-performance-wind-region coincident with the operating winds including excursions. Performance capability from a lesser alphabetical region can safely be used in a greater alphabetical region. Performance capability from a greater alphabetical region cannot be safely used in a lesser alphabetical region.

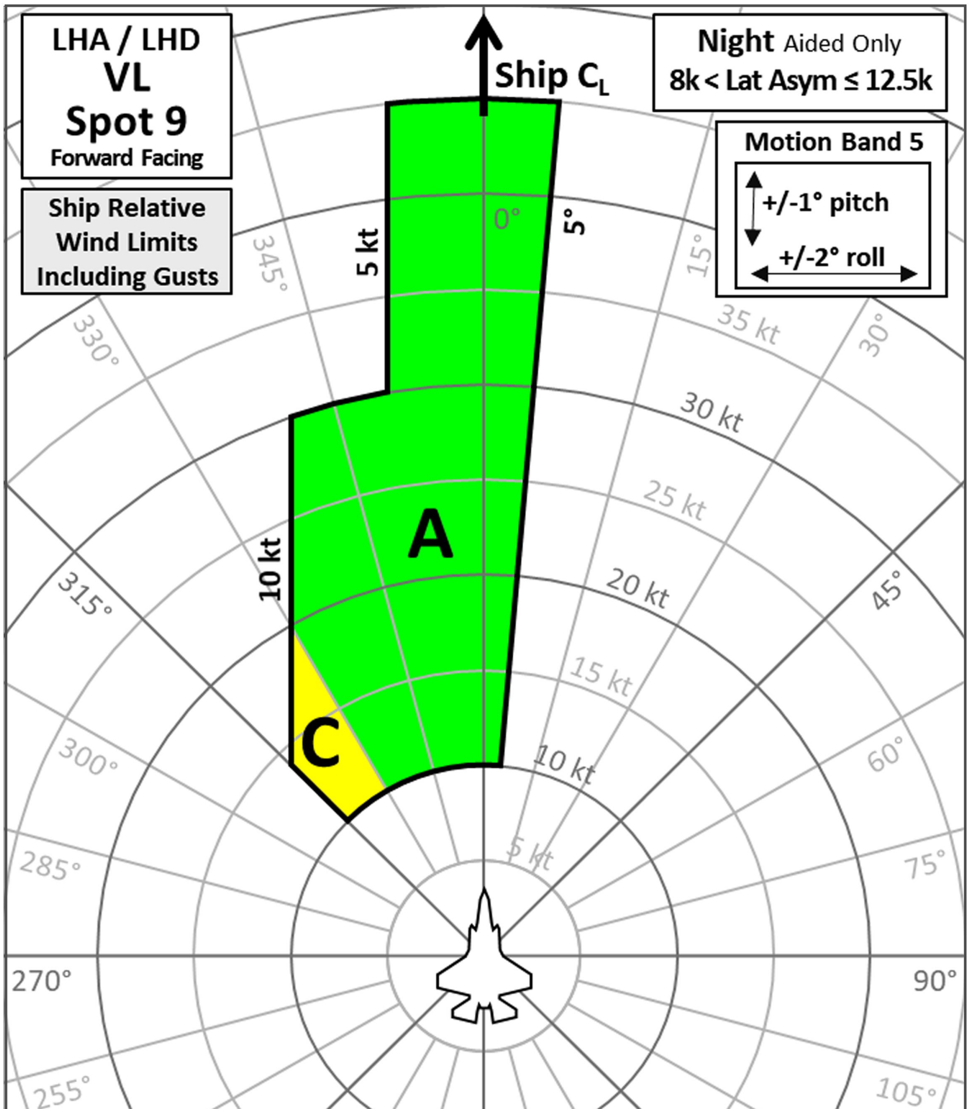
Figure A-83. Spot 7 Aided/UnAided Night 8k < Lat Asym ≤ 12.5k Motion Band 5




| Max Deck Motion Band | Max Ship Deck Roll Angle | Max Ship Deck Pitch Angle | |
|---|---|---|---|
| | | Bow Down | Bow Up |
| Band 5 | ± 2.0° | -1.0° | +1.0° |

NOTES:
1. Target alignment: Pilot eye at the intersection of the Tramline and Spot 7 athwartship line.

Figure A-84. Spot 9 Aided Only Night 8k < Lat Asym ≤ 12.5k Motion Band 5




| Max Deck Motion Band | Max Ship Deck Roll Angle | Max Ship Deck Pitch Angle | |
|---|---|---|---|
| | | Bow Down | Bow Up |
| Band 5 | ± 2.0° | -1.0° | +1.0° |

NOTES:
1. Target alignment: Pilot eye at the intersection of the Tramline and Spot 9 athwartship line.
2. Wind Regions are alphabetized according to performance capabilities from most performance (Region A) to least performance (Region C). Performance shall be calculated using the least-performance-wind-region coincident with the operating winds including excursions. Performance capability from a lesser alphabetical region can safely be used in a greater alphabetical region. Performance capability from a greater alphabetical region cannot be safely used in a lesser alphabetical region.

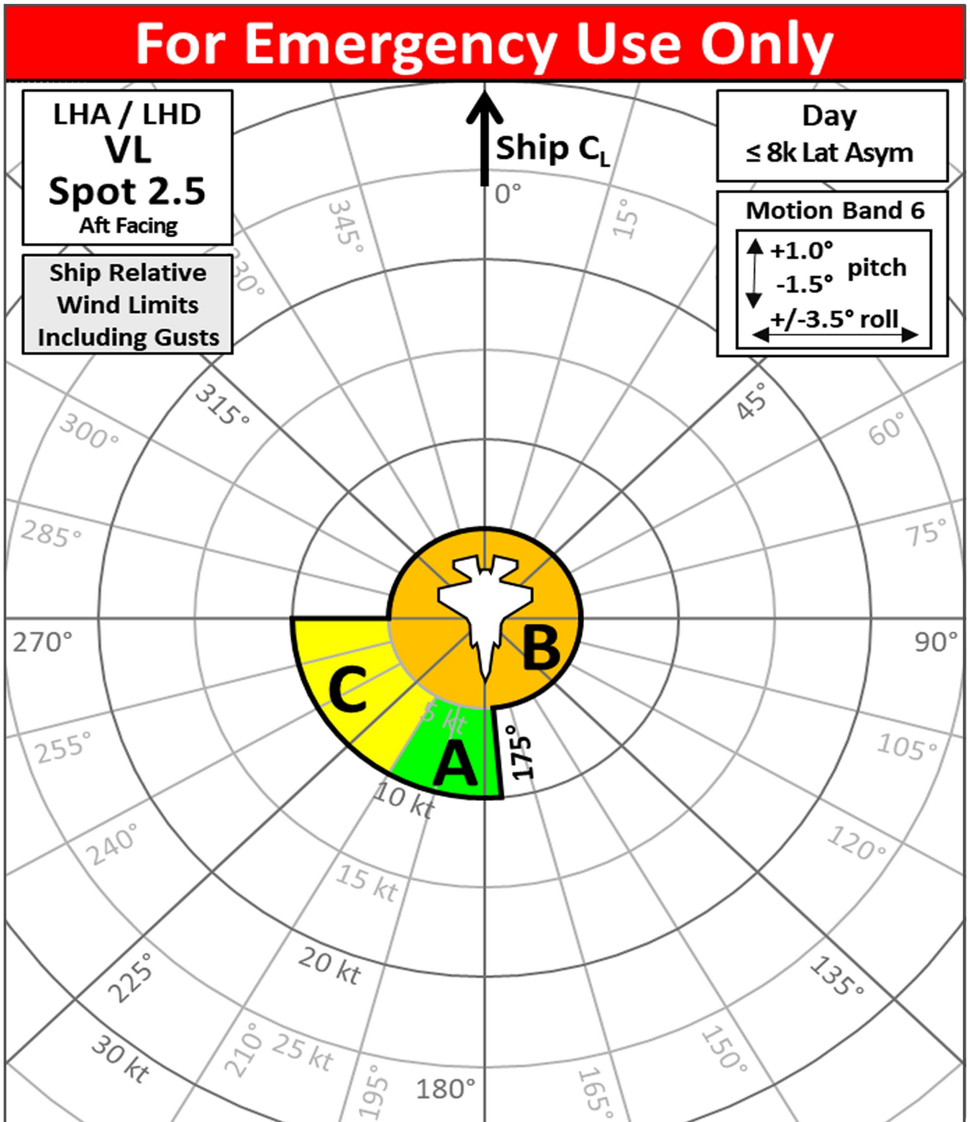
Figure A-85. STOVL Ship-based Aft-Facing Vertical-Landing (VL) Ship Relative Wind and Motion Limitations (Lat Asym ≤ 8,000 ft-lb)

| DAY/ NIGHT | VL DECK SPOT (1) | ABSOLUTE LAT ASYM (FT-LB) | MAX SHIP DECK ANGLES (2) | | | MAX DECK MOTION BAND | FIGURE NUMBER |
|---|---|---|---|---|---|---|---|
| | | | ROLL ANGLE | PITCH ANGLE | | | |
| | | | | BOW DOWN | BOW UP | | |
| Day | 2.5 | ≤8k | ±3.5° | -1.5° | +1.0° | Band 6 | Figure A-86 |
| | 7.5 | ≤8k | ±3.5° | -1.5° | +1.0° | Band 6 | Figure A-87 |

NOTES:

1. The aircraft heading is assumed to be nominally the opposite the ship's Base Recovery Course (BRC) for Aft-facing Vertical Landings.
2. Ship deck pitch and roll angles are absolute. Max angles includes both trim and motion.

Figure A-86. Spot 2.5 Day ≤ 8k Lat Asym Motion Band 6

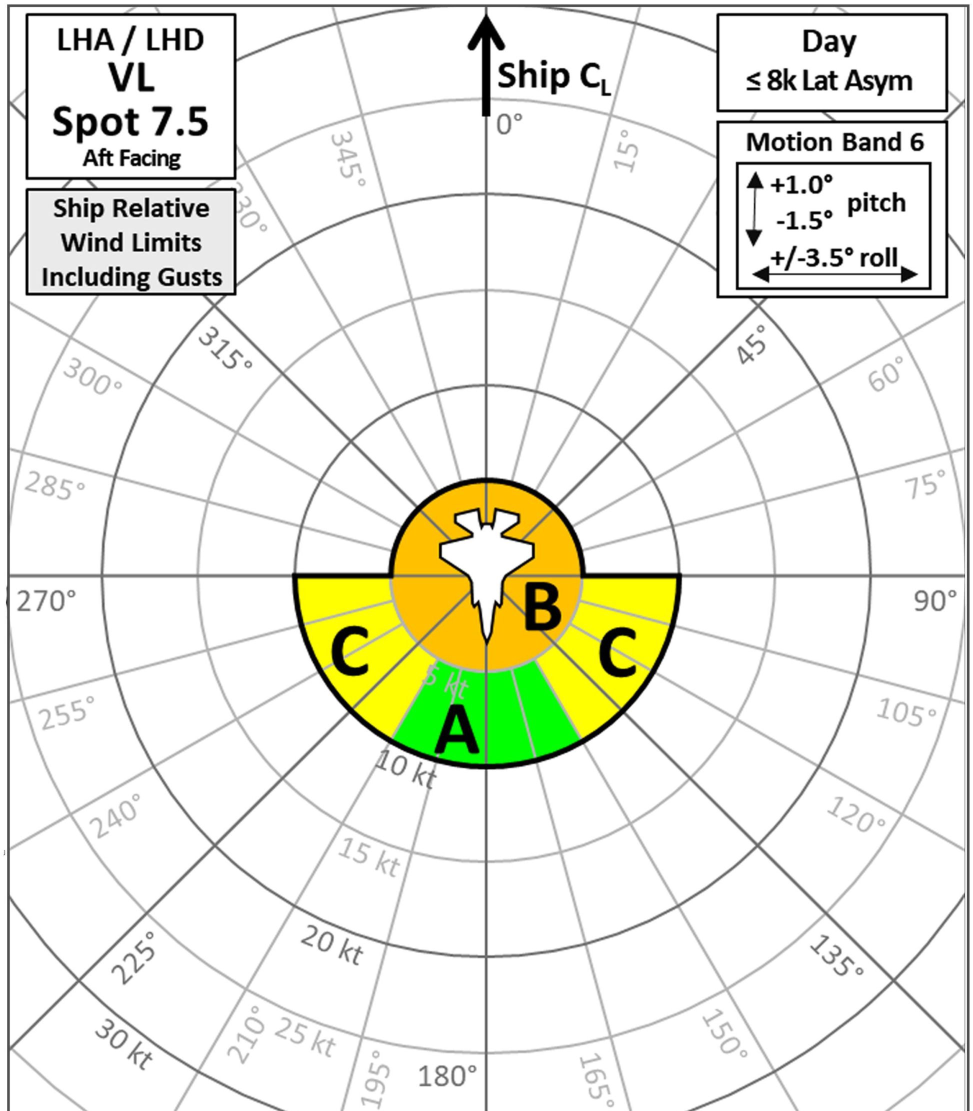



| Max Deck Motion Band | Max Ship Deck Roll Angle | Max Ship Deck Pitch Angle | |
|---|---|---|---|
| | | Bow Down | Bow Up |
| Band 6 | ± 3.5° | -1.5° | +1.0° |

NOTES:

1. Target alignment: Pilot eye over the Tramline and aligned with Spot 3 athwartship line.
2. Wind Regions are alphabetized according to performance capabilities from most performance (Region A) to least performance (Region C). Performance shall be calculated using the least-performance-wind-region coincident with the operating winds including excursions. Performance capability from a lesser alphabetical region can safely be used in a greater alphabetical region. Performance capability from a greater alphabetical region cannot be safely used in a lesser alphabetical region.

Figure A-87. Spot 7.5 Day ≤ 8k Lat Asym Motion Band 6




| Max Deck Motion Band | Max Ship Deck Roll Angle | Max Ship Deck Pitch Angle | |
|---|---|---|---|
| | | Bow Down | Bow Up |
| Band 6 | ± 3.5° | -1.5° | +1.0° |

NOTES:

1. Target alignment: Pilot eye over the Tramline and aligned with Spot 8 MLG Wheel Boxes.
2. Wind Regions are alphabetized according to performance capabilities from most performance (Region A) to least performance (Region C). Performance shall be calculated using the least-performance-wind-region coincident with the operating winds including excursions. Performance capability from a lesser alphabetical region can safely be used in a greater alphabetical region. Performance capability from a greater alphabetical region cannot be safely used in a lesser alphabetical region.

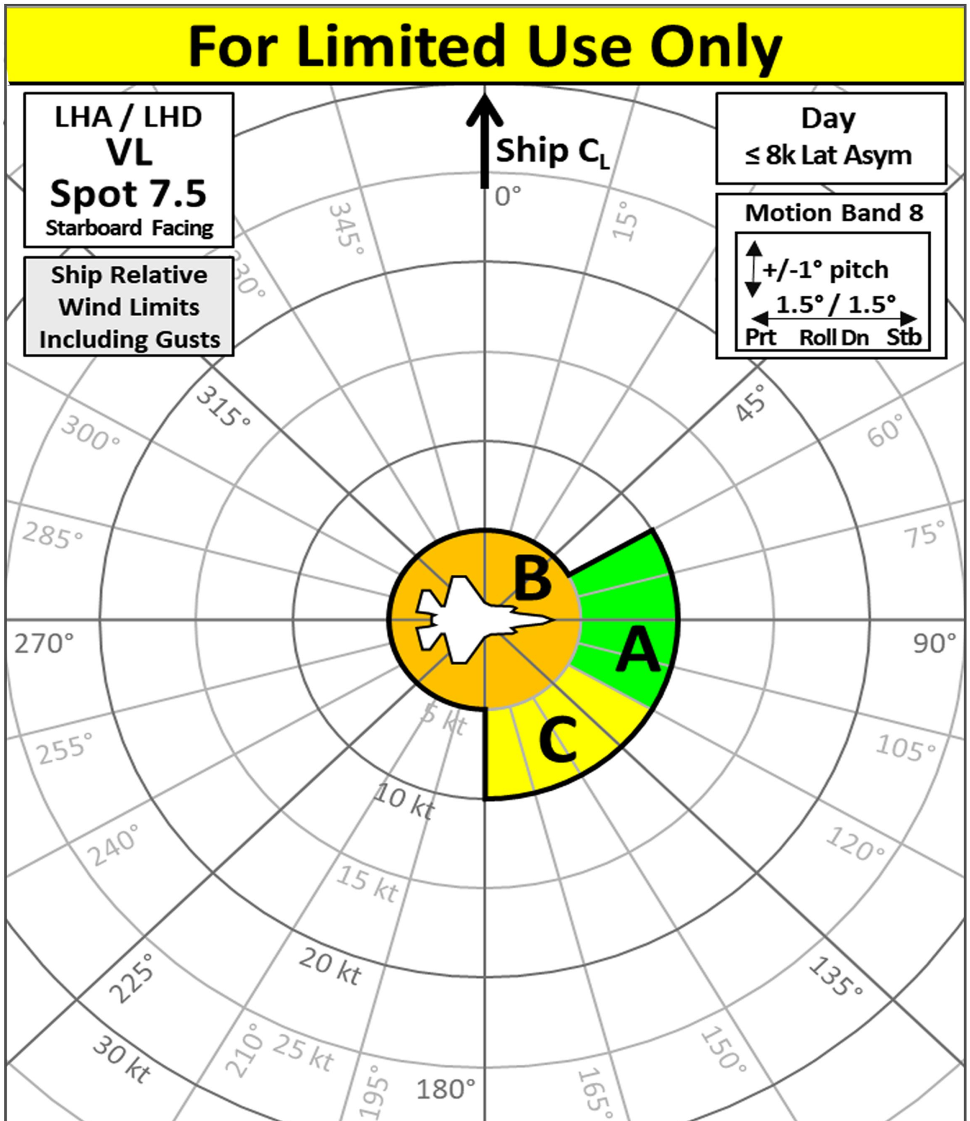
Figure A-88. STOVL LHA/LHD Ship-based Cross-Axial Vertical-Landing (VL) Ship Relative Wind and Motion Limitations

| DAY/ NIGHT | VL DECK SPOT (1) | ABSOLUTE LAT ASYM (FT-LB) | MAX SHIP DECK ANGLES (2) | | | MAX DECK MOTION BAND | FIGURE NUMBER |
|---|---|---|---|---|---|---|---|
| | | | PITCH ANGLE | ROLL ANGLE | | | |
| | | | | PORT DOWN | STBD DOWN | | |
| Day | 7.5 Stbd-Facing | ≤8k | ±1.0° | 1.5° | 1.5° | Band 8 | Figure A-89 |
| Day | 9 Port-Facing | ≤8k | ±1.0° | 0.5° | 1.5° | Band 7 | Figure A-90 |

NOTES:

1. Cross-axial Approaches and Vertical Landings are limited to 90⁰ perpendicular to the ship's Base Recovery Course (BRC).
2. Ship deck pitch and roll angles are absolute. Max angles include both trim and motion.

Figure A-89. Spot 7.5 Day Cross-Axial Starboard-Facing VL ≤ 8k Lat Asym Motion Band 8




| Max Deck Motion Band | Max Ship Deck Pitch Angle | Max Ship Deck Roll Angle | |
|---|---|---|---|
| | | Port Down | Starboard Down |
| Band 8 | ± 1.0° | 1.5° | 1.5° |

**WARNING**

Failure to clear aft slash of personnel and equipment may result in damage or injury.

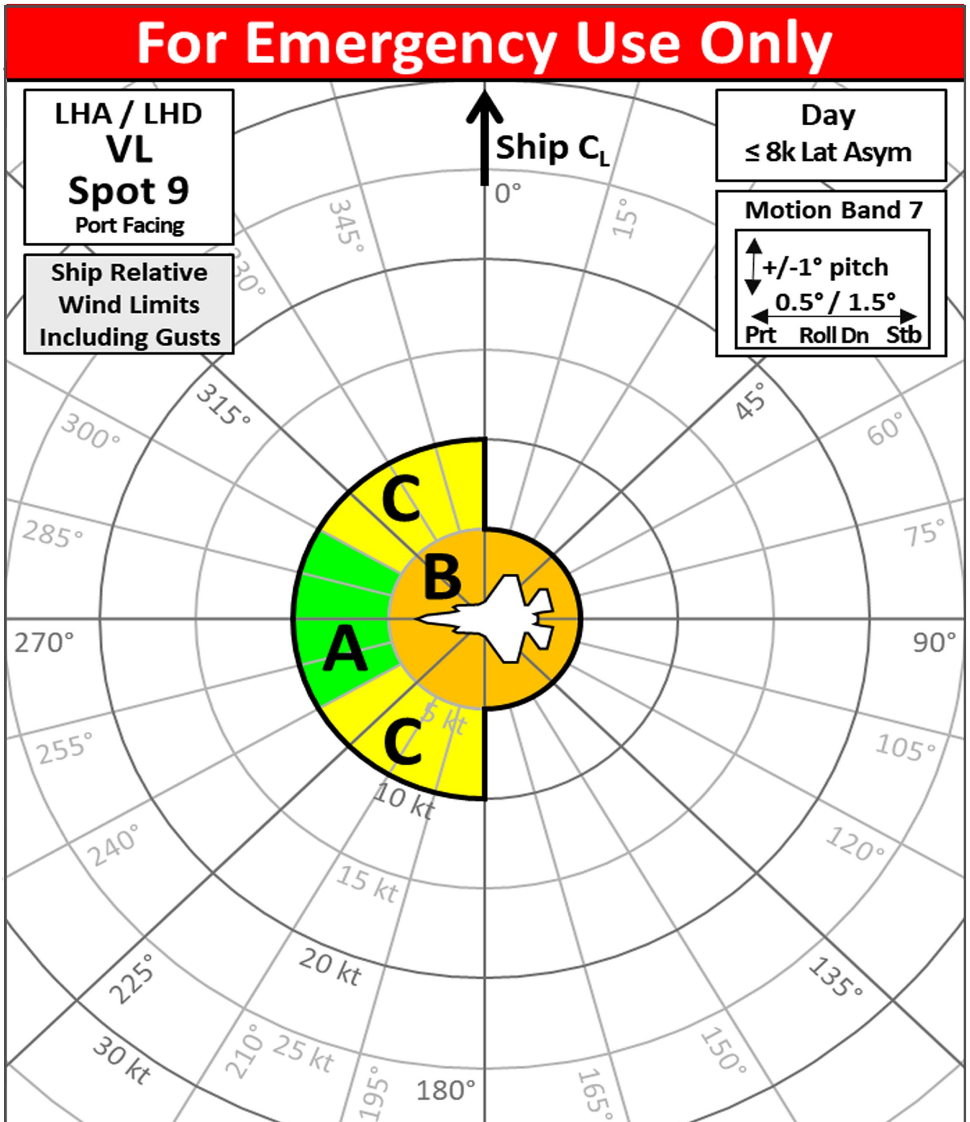
**CAUTION**

Aircraft will extend beyond the Fixed Wing Safe Parking line.

Figure A-89. Spot 7.5 Day Cross-Axial Starboard-Facing VL ≤ 8k Lat Asym Motion Band 8 (cont.)

NOTES:
1. For Limited Use Only: Non-Emergency landings are limited to two landings within a one hour period and are not to exceed TEDSAP deck heating limits.
2. Clear aft-slash of aircraft equipment and personnel, prior to commencing cross-axial approaches.
3. Target alignment: Pilot eye aligned with Fixed Wing Safe Parking line and Spot 8 athwartship line.
4. Wind Regions are alphabetized according to performance capabilities from most performance (Region A) to least performance (Region C). Performance shall be calculated using the least-performance-wind region coincident with the operating winds including excursions. Performance capability from a lesser alphabetical region can safely be used in a greater alphabetical region. Performance capability from a greater alphabetical region cannot be safely used in a lesser alphabetical region.

Figure A-90. Spot 9 Day Cross-Axial Port-Facing VL ≤ 8k Lat Asym Motion Band 7




| Max Deck Motion Band | Max Ship Deck Pitch Angle | Max Ship Deck Roll Angle | |
|---|---|---|---|
| | | Port Down | Starboard Down |
| Band 7 | ± 1.0° | 0.5° | 1.5° |

**WARNING**

Failure to clear aft slash of personnel and equipment may result in damage or injury.

**CAUTION**

Aircraft will extend beyond the Fixed Wing Safe Parking line.

Figure A-90. Spot 9 Day Cross-Axial Port-Facing VL ≤ 8k Lat Asym Motion Band 7 (cont.)

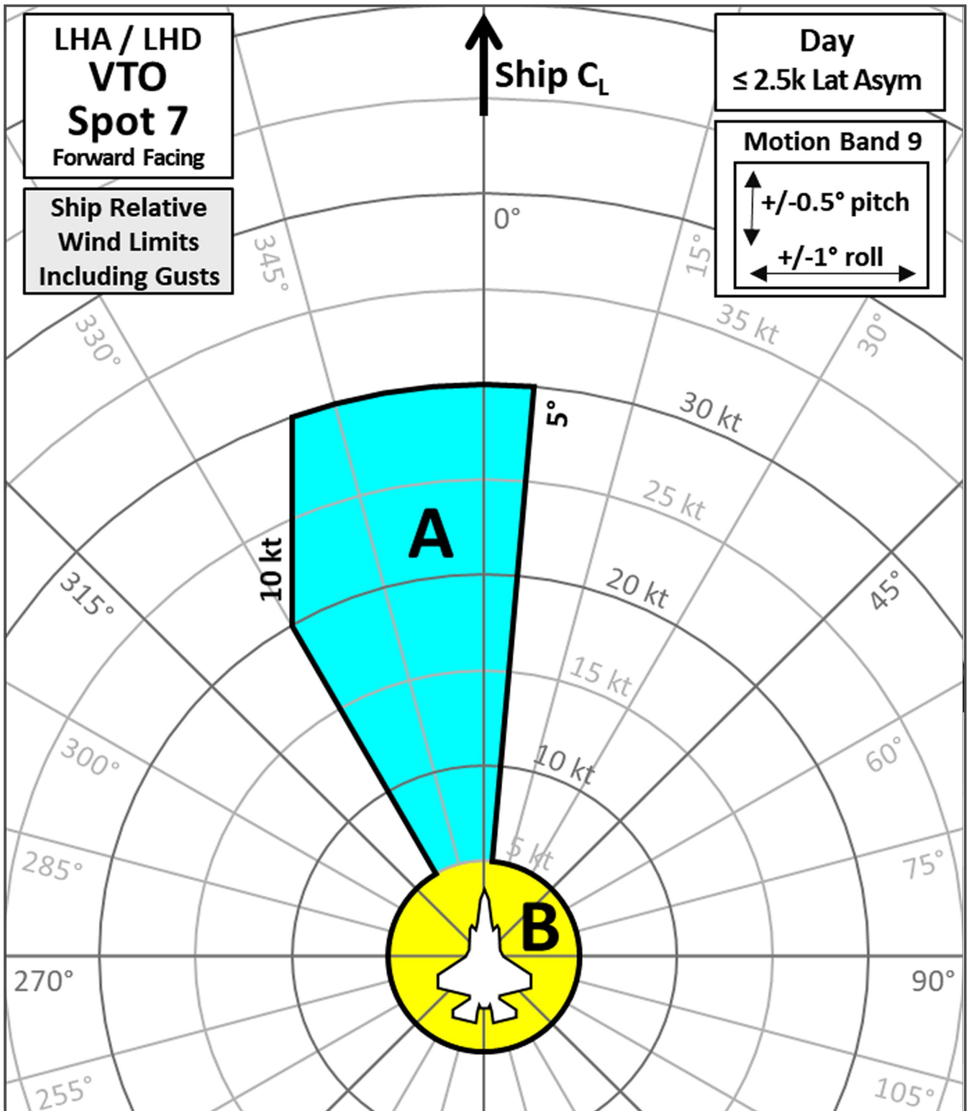
NOTES:
1. Clear aft-slash of aircraft equipment and personnel, prior to commencing cross-axial approaches.
2. Target alignment: Pilot eye at the intersection of the Spot 9 athwartship and longitudinal lines.
3. Wind Regions are alphabetized according to performance capabilities from most performance (Region A) to least performance (Region C). Performance shall be calculated using the least-performance-wind region coincident with the operating winds including excursions. Performance capability from a lesser alphabetical region can safely be used in a greater alphabetical region. Performance capability from a greater alphabetical region cannot be safely used in a lesser alphabetical region.

Figure A-91. STOVL LHA/LHD Ship-based Vertical-Takeoff (VTO) Ship Relative Wind and Motion Limitations

| DAY/ NIGHT | VTO DECK SPOT (1,2,3) | ABSOLUTE LAT ASYM (FT-LB) | MAX SHIP DECK ANGLE (4) | | | MAX DECK MOTION BAND | FIGURE NUMBER |
|---|---|---|---|---|---|---|---|
| | | | ROLL ANGLE | PITCH ANGLE | | | |
| | | | | BOW DOWN | BOW UP | | |
| Day | 7 Fwd Facing | ≤2.5k | ±1.0° | -0.5° | +0.5° | Band 9 | Figure A-92 |
| | 9 Fwd Facing | ≤2.5k | ±1.0° | -0.5° | +0.5° | Band 9 | Figure A-93 |
| | 7.5 Aft Facing | ≤2.5k | ±1.0° | -0.5° | +0.5° | Band 9 | Figure A-94 |

NOTES:
1. Alphabetized region colors on jet-borne VTO figures are purposefully different than those on jet-borne VL figures. VTO figure color differences accommodate unique jet-borne HWR calculations and provide visual distinction from VL figures. VTO performance capabilities are not consistent with VL performance capabilities in like colored or alphabetized regions. VTO performance capabilities are self-consistent for VTO alphabetized regions and colors.
2. The aircraft heading is assumed to be nominally the same as the ship's Base Recovery Course (BRC) for Forward-Facing Vertical Takeoffs.
3. The aircraft heading is assumed to be nominally the opposite the ship's Base Recovery Course (BRC) for Aft-Facing Vertical Takeoffs.
4. Ship deck pitch and roll angles are absolute. Max angles includes both trim and motion.

Figure A-92. Spot 7 Day Forward Facing VTO ≤ 2.5K Lat Asym Motion Band 9

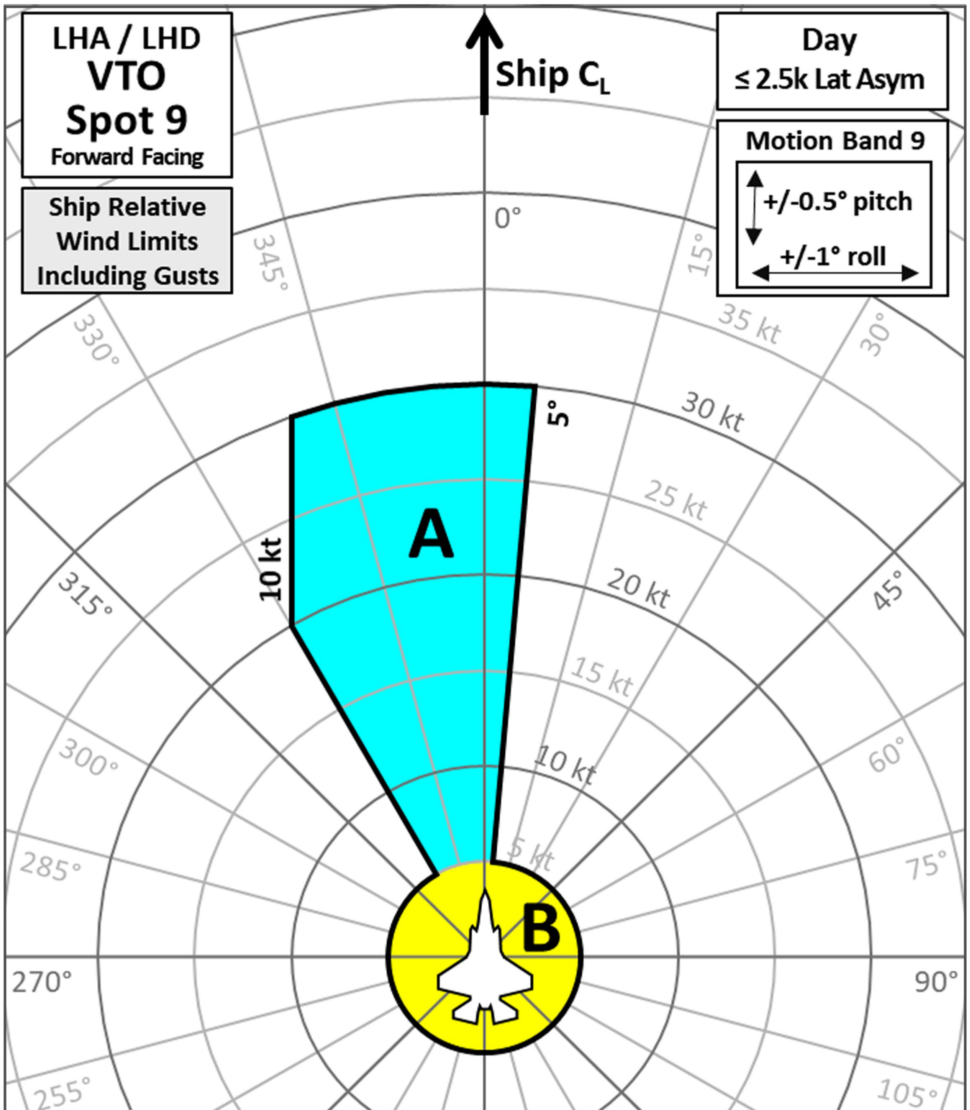



| Max Deck Motion Band | Max Ship Deck Roll Angle | Max Ship Deck Pitch Angle | |
|---|---|---|---|
| | | Bow Down | Bow Up |
| Band 9 | ± 1.0° | -0.5° | +0.5° |

NOTES:

1. Target alignment: Pilot eye at the intersection of the Tramline and Spot 7 athwartship line.
2. Wind Regions are alphabetized according to performance capabilities from most performance (Region A) to least performance (Region B). Performance shall be calculated using the least-performance-wind-region coincident with the operating winds including excursions. Performance capability from a lesser alphabetical region can safely be used in a greater region. Performance Capability from a greater alphabetical regions cannot be safely used in a less alphabetical region.

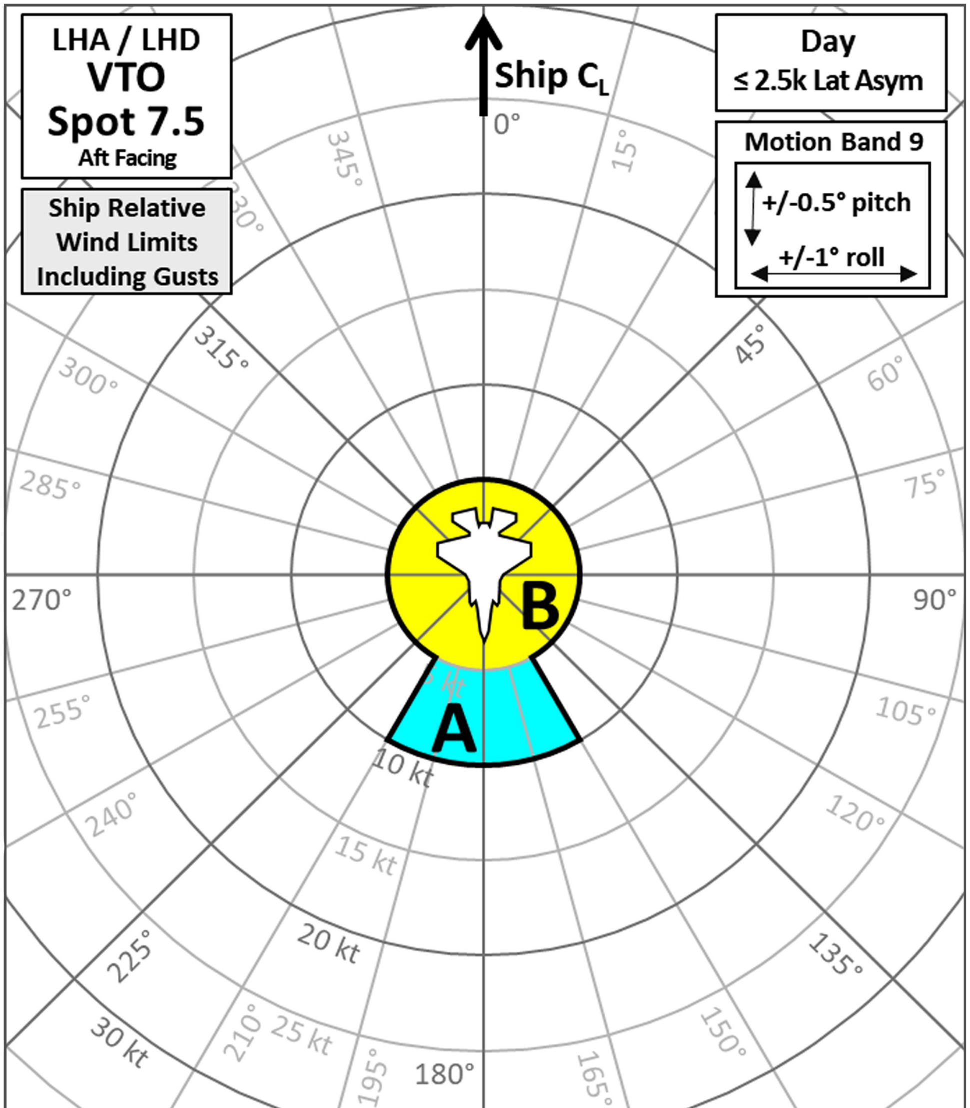
Figure A-93. Spot 9 Day Forward Facing VTO ≤ 2.5K Lat Asym Motion Band 9




| Max Deck Motion Band | Max Ship Deck Roll Angle | Max Ship Deck Pitch Angle | |
|---|---|---|---|
| | | Bow Down | Bow Up |
| Band 9 | ± 1.0° | -0.5° | +0.5° |

NOTES:
1. Target alignment: Pilot eye at the intersection of the Tramline and Spot 9 athwartship line.
2. Wind Regions are alphabetized according to performance capabilities from most performance (Region A) to least performance (Region B). Performance shall be calculated using the least-performance-wind-region coincident with the operating winds including excursions. Performance capability from a lesser alphabetical region can safely be used in a greater alphabetical region. Performance capability from a greater alphabetical region cannot be safely used in a lesser alphabetical region.

Figure A-94. Spot 7.5 Day Aft Facing VTO ≤ 2.5K Lat Asym Motion Band 9




| Max Deck Motion Band | Max Ship Deck Roll Angle | Max Ship Deck Pitch Angle | |
|---|---|---|---|
| | | Bow Down | Bow Up |
| Band 9 | ± 1.0° | -0.5° | +0.5° |

NOTES:

1. Target alignment: Pilot eye over the Tramline and aligned with Spot 8 MLG Wheel Boxes.
2. Wind Regions are alphabetized according to performance capabilities from most performance (Region A) to least performance (Region B). Performance shall be calculated using the least-performance-wind region coincident with the operating winds including excursions. Performance capability from a lesser alphabetical region can safely be used in a greater alphabetical region. Performance capability from a greater alphabetical region cannot be safely used in a lesser alphabetical region.

## APPENDIX B

# AV-8B/F-35B Training Syllabus for Ship Personnel

### B.1 PHASE I — SHIPBOARD ORIENTATION

As required in Chapter 1, ship's personnel shall be familiar with the vertical takeoff and landing operations involving fixed-wing aircraft prior to actually operating the aircraft. This training phase is required for all air department personnel and other ship's company that will be directly involved in flight operations and shall specifically include the Air Operations Officer, AATCC personnel, and all qualified Officers of the Deck. This training shall be conducted by an Advanced/Training fixed-wing LSO. The following topics are considered minimum requirements:

| | |
|---|---|
| 1. "Introduction to the AV-8" (movie) | 0.5 hour |
| 2. Aircraft description (lecture using NATOPS, diagrams, etc.) | 0.5 hour |
| 3. Flight deck preparations (lecture) | 0.5 hour |
| 4. Taxi and LSO signals (lecture and demonstration) | 0.5 hour |
| 5. Familiarization with fixed-wing aircraft handling personnel and their responsibilities (lecture) | 0.5 hour |
| 6. General safety considerations delineating specific hazards involved (lecture) | 0.5 hour |
| | **Total 3.0 hours** |

### B.2 PHASE II — GROUND TRAINING

This phase of training shipboard personnel is to be conducted at an air station by an Advanced/Training fixed-wing LSO. It is to be presented to members of the ship's air department and other members of the ship's company that will be directly involved in fixed-wing aircraft flight deck operations. This ground training will include lectures, demonstrations, and small group walkarounds. The following topics will be addressed as minimum requirements:

| | |
|---|---|
| 1. General familiarization with fixed-wing aircraft (walkaround and lecture) | 0.5 hour |
| 2. Simulated deck handling evolution conducted on LHD/LHA deck configurations and markings laid out on ramp. This would include towing and tiedowns with the use of down locks, chains, and chock (lecture and demonstration) | 0.5 hour |
| 3. Starting, shutdown, taxiing, and installation of pins (lecture and demonstration) | 0.5 hour |
| 4. Fueling and defueling procedures (lecture and demonstration) | 0.5 hour |
| 5. Hung ordnance procedures, including spotting aircraft for arming/dearming of air-launched weapons (lecture and demonstration) | 0.5 hours |
| 6. Firefighting procedures (lecture) | 0.5 hour |
| 7. Pilot rescue procedures (lecture and demonstration) 0.5 hours (lecture) | 0.5 hour (demonstration) |
| 8. LSO and launch officer signals and procedures (lecture and demonstration) | 0.5 hour |
| 9. Cockpit orientation — emergency and normal canopy release, ejection seat procedures, and throttle and battery switch location (lecture and static display) | 0.5 hour |

| | |
|---|---|
| 10. Aircraft hazard area (lecture) | 0.5 hour |
| 11. Several actual takeoffs and landings of fixed wing (demonstration) | 0.5 hour |
| | **Total 6.0 hours** |
| 12. AATCC fixed-wing requirements lecture | 2 hours |
| 13. AATCC AV-8B Simulator Exposure for PAR Operations | 2 hours |
| 14. AATCC AV-8B Air Station Radar Room Simulator and Practical Application | 2 hours |

## B.3 PHASE III — FINAL SHIPBOARD TRAINING

This phase of training is to be conducted on board ship by an Advanced/Training fixed-wing LSO (assisted by ship's personnel and appropriate fixed-wing personnel). Only members of the ship's air department and members of the ship's company directly involved in fixed-wing aircraft flight deck operations are required to take part in this training phase. The following topics will be addressed as minimum requirements:

| | |
|---|---|
| 1. General familiarization with fixed wing in shipboard environment (lecture) | 0.5 hour |
| 2. Securing aircraft and associated equipment for heavy seas and normal conditions (lecture and demonstration) | 1.0 hour |
| 3. Flight deck preparation (lecture and demonstration) | 0.5 hour |
| 4. Fueling and defueling procedures (lecture and demonstration) | 0.5 hour |
| 5. Pilot rescue procedures (lecture) | 0.5 hour |
| 6. Crash and salvage procedures (lecture) | 1.0 hour |
| 7. Safe approach paths and LSO procedures (lecture and demonstration) | 0.5 hour |
| 8. Hazardous areas — hot spots, and so forth (lecture) | 0.5 hour |
| 9. Towing, starting, shutdowns and taxiing; use of chocks, chains, down locks; installation of pins (lecture and demonstration) | 1.0 hour |
| 10. Five actual takeoffs and landings (demonstration) | 1.0 hour |
| 11. AATCC training, fixed-wing specific communications, terminology, flying speeds, and approach profiles (lecture) | 1.0 hour |
| | **Total 8.0 hours** |

APPENDIX C

# PriFly/Flight Deck Communications During Flight Quarters

## C.1 SCOPE

This appendix contains recommended standard verbal announcements, radio transmissions, and deck status light signals to be issued by PriFly/Flight Deck during flight quarters, as referred to in Chapter 5.

## C.2 RECOMMENDED LAUNCH CYCLE COMMUNICATIONS

The following are recommended communications to be initiated by PriFly/Flight Deck during an aircraft launch cycle:

**Flight Quarters — Called away 1.5 hours to 1 hour prior to launch**

1. **1.5 hours to 1 hour prior to launch**

   5 MC: "On the flight deck, all hands on the bow for a FOD walkdown." (with permission from Bridge)

   1 MC: Primary will announce: "The following is a test of the A/C warning and crash alarms from Primary: _______________ test complete."

2. **45 minutes to 30 minutes prior to launch**

   5 MC: "All unauthorized personnel clear the flight deck, catwalks, and troop walkways. All remaining personnel don the proper flight deck uniform: Helmets on and buckled, sleeves rolled down, goggles down, lifevests on and securely fastened."

3. **20 minutes prior to launch**

   5 MC: "Check chocks, chains, fire bottles, and all loose gear about the deck. Plane captains and troubleshooters check your tool pouches for accountability. Stand clear of intakes, exhausts, and rotors. Clear to start APUs and spread spots _______________ ."

4. Deck status light: *RED*

   5 MC/MOMS/HYDRA: "Clear to start engines spots _______________ ."

   5 MC: "Start all AV-8 aircraft." (Proceed to Step 8. if AV-8s are first)

5. Deck status light: *AMBER*

   5 MC/MOMS/HYDRA: "Engage spots _______________." Repeat until each is engaged.

6. Deck status light: *RED*

   5 MC: "Load all go aircraft" (Request "Green Deck" from Bridge)

7. Radio from PriFly: "99 aircraft, tower, radio check, in order, starting with spot _______________ aft."

8. Radio from PriFly: “Tower reads all loud and clear. Prebriefed departures and recoveries remain the same (or state changes).”

   “Relative wind is _____ at _____ knots.”

   “True wind is _____ at _____ knots.”

   “Altimeter is _______________.”

   “Expected BRC is _______________.”

9. MOMS/HYDRA: “Taxi AV-8s in order, to _______________ foot mark.”

**HELOS**

10. Deck status light: *GREEN*
11. Radio from PriFly: “Cleared to launch on LSE signal.”
12. MOMS/HYDRA: “Launch A/C in order spots _______________.”

**AV-8s**

13. Deck status light: *AMBER*
14. MOMS/HYDRA: “Cleared AV-8 Run-Ups A/C__”
15. Deck status light: *GREEN*
16. MOMS/HYDRA: “Cleared to launch A/C__”

**HELOS and AV-8s**

17. Radio from PriFly: “_______________ this is tower, Push (circuit net). No joy, POGO.”

    5 MC/MOMS/HYDRA: “Launch complete.”

18. Deck status light: *RED*

## C.3 RECOMMENDED RECOVERY CYCLE COMMUNICATIONS

The following are recommended communications to be initiated by PriFly/Flight Deck during an aircraft recovery cycle. AV-8B communications will be in accordance with NAVAIR 00-80T-111:

**Set Flight Quarters — 1 hour prior to recovery time**

1. **45 minutes prior to recovery**

   5 MC: “On the flight deck, all hands on the bow for a FOD walkdown.” (with permission from Bridge)

2. **15 minutes prior to recovery**

   Deck status light: *RED*

   5 MC: “All unauthorized personnel clear the flight deck, catwalks, and troop walkways. All remaining personnel don the proper flight deck uniform: Helmets on and buckled, sleeves rolled down, goggles down, lifevests on and securely fastened.”

3. **After ensuring Manned and Ready and having been granted permission for a Green deck from the Bridge**

   5 MC: “On the flight deck, aircraft inbound, stand by to recover spot(s) _______________.”

   Deck status light: *GREEN*

4. **After hand off from AATCC**

| | |
|---|---|
| Radio from PriFly: | "(A/C call) (and flight) cleared to break (or straight-in, etc.). Report the 180 or 1 mile final." |

5. **A/C at the 180 (Day/VFR) or on a 1 mile final**

| | |
|---|---|
| Radio from PriFly: | Gear call and which seat landing. |
| Radio from PriFly: | "(A/C Call) Roger spot ______________ ." |
| 5 MC/MOMS/HYDRA: | "(A/C [spot] [seat])." |

6. **A/C on deck**

| | |
|---|---|
| MOMS/HYDRA: | "Hot pump, shut down, rearm, load serial, water, etc., as necessary." |

7. **Recovery cycle complete**

| | |
|---|---|
| 5 MC/MOMS/HYDRA: | "Recovery complete." |
| 5 MC/MOMS/HYDRA: | "Stand clear spot ______________ disengaging rotors." |
| Deck status light: | *AMBER* |

8. **All A/C rotors disengaged**

| | |
|---|---|
| Deck status light: | *RED* |

9. **Upon concurrence from Bridge**

| | |
|---|---|
| 1 MC: | "Secure from flight quarters. Set the Aircraft Integrity Watch." |

## APPENDIX D

# Flight Deck Clothing

## D.1 FLIGHT DECK CLOTHING

Figure D-1 provides standard clothing and markings as required in Chapter 3 for personnel assigned to flight quarters stations.

Figure D-1. LHA/LHD Flight Deck Clothing Colors and Markings

| PERSONNEL | HELMET[1] | JERSEY | JERSEY/FLOAT COAT SYMBOLS |
|---|---|---|---|
| Aircraft Handling Crew and Chockmen | Blue | Blue | Crew Number |
| ACHOs, CPO, LPO | Yellow | Yellow | Billet Title |
| Elevator Operators | White | Blue | E |
| LSE (Crew Directors) | Yellow | Yellow | Crew Number |
| Squadron Maintenance Crews | Green | Green | Black Stripe and Squadron Designator |
| Medical | White | White | Red Cross |
| Messengers and Telephone Talkers | White | Blue | T |
| Ordnance | Red | Red | Black Stripe and Squadron Designator/Ship's Billet Title |
| Photographers | Green | Green | P |
| Plane Captains | Brown | Brown | Squadron Designator |
| Crash and Salvage Crews | Red | Red | Crash/Salvage |
| Tractor Driver | Blue | Blue | Tractor |
| Aircraft Intermediate Maintenance Department (AIMD) Maintenance Crews | Green | Green | Black Stripe broken by abbreviation of specialty that is, P/P (Power Plants) |
| Aviation Fuel Crew | Purple | Purple | F |
| Aviation Fuel Officer | Purple | Purple | Fuel Officer |
| Combat Cargo | White | White | Combat Cargo |
| Safety Observer | White | White | Green Cross |

Notes:

1. Flight deck approved cranial.
2. The life preserver, vest type, U.S. Navy, Mk 1, is designed for prolonged wear while engaged in flight deck activity and is available in colors identical to those listed above.
3. Helmets for all personnel shall be marked with a 6-inch square (or equivalent) of white reflective tape on the back shell and a 3-inch by 6-inch piece (or equivalent) on the front shell. Helmets shall have a 2-inch piece of velcro on the left shell and velcro on the survival light.

Figure D-1. LHA/LHD Flight Deck Clothing Colors and Markings (cont.)

| PERSONNEL | HELMET[1] | JERSEY | JERSEY/FLOAT COAT SYMBOLS |
|---|---|---|---|

Notes:

4. Combination cranial helmets for the following personnel shall be marked with three vertical reflective international orange stripes, 1-inch wide, evenly spaced, placed on top of white reflective tape:
   a. All officers.
   b. Flight and hangar deck chief petty officer and leading petty officer.
   c. Crash and salvage chief petty officer and leading petty officer.
   d. EOD team members.
   e. Squadron's ordnance officer.
   f. Ship's air gunner.
5. The ordnance arming/safety supervisor at night shall have two red standard wands banded with two 3/4-inch bands equally spaced on the cones.
6. Helmets for all ship's personnel who have not completed the flight deck observer qualification shall be marked (front and rear) with a "T" using 1 inch wide blue reflective tape over existing reflective tape (front minimum 2-inch tall, rear minimum 3-inch tall lettering).
7. Helmets for all LSEs and Aircraft Directors under instruction shall be marked (front and rear) with a "U/I" using 1-inch wide blue reflective tape evenly spaced over existing reflective tape (front minimum 2-inch tall, rear minimum 3-inch tall lettering).
8. All personnel that are assigned to the flight deck or participate in flight operations and aircraft maintenance shall wear NAVAIR approved flame retardant uniforms. This includes but is not limited to: approved cranial, eyewear, flame retardant top and pants, leather gloves and leather steel-toed shoes.
9. All signal wands/flashlights shall be secured with heat shrink/duct tape to prevent cone separation.

## APPENDIX E

# Mixed/Multiservice Aircraft Spotting Matrix (US Matrix)

### E.1 MULTISERVICE HELICOPTERS SPOTTING MATRIX

Figures E-1 and E-2 provide helicopter spotting matrices for use during multiservice helicopter operations as described in Chapters 3 and 10.

Helicopters landing behind engaged tail rotor aircraft shall not conduct cross-cockpit takeoffs or landings for LSE safety.

**WARNING**

- Rotor downwash created by the H-53 and the V-22 is greater than that produced by any other embarked helicopter. This downwash is sufficient to damage spread helicopter rotor blades and blow aircraft chocks, tiedown chains, and towbars about the deck or overboard, and cause personnel injury or death.
- H-53 and V-22 launch and recovery operations directly behind any unsecured light to medium lift tail rotor helicopter may cause uncommanded yaw of the forward helicopter due to H-53 and V-22 downwash resulting in possible aircraft damage and/or personnel injury or death.

**CAUTION**

- When launching/recovering, damage from downwash to aircraft stowed abeam the spot in use may occur even when folded, crutched, and properly secured.
- Combination of relative winds and rotor downwash when landing a helicopter/tiltrotor immediately adjacent to a spot occupied by a shutdown helicopter, not folded and secured, may cause rotor system damage to the shutdown helicopter.
- Rotor blade tiedowns alone may not be sufficient to preclude rotor blade flapping and subsequent damage.
- In situations where a V-22 is landing in front of a spread helicopter, the risk for rotor blade damage increases with port winds over the flight deck.
- V-22 high exhaust temperatures can cause long-term fatigue damage to deck plating. Failure to follow Deck Heating Mitigation procedures (Paragraph 8.2.7) may result in permanent damage to the flight deck.

**Note**

In the event of an aircraft requiring respotting in the flight ready position, the aircraft can be towed and manually folded, if required. Other aircraft can launch and recover on spots forward and aft of an aircraft in all static configurations.

Figure E-1. AV-8B/TAV-8B/F-35B/Helicopter/Tiltrotor Minimum Separation for VTOL Operations LHD/LHA-6 Type

| AV-8B/TAV-8B/F-35B/VTOL SPOT | AUTHORIZED WITH HELICOPTERS/TILTROTORS AT SPOTS |
|---|---|
| 2 (AV-8B/TAV–8B only) | 5, 6, 7, 8, 9 |
| 2.5 | 5, 6, 7, 8, 9 |
| 4 | 6, 7, 8, 9 |
| 5 | 1, 2, 7, 8, 9 |
| 6 | 1, 2, 3, 4, 8, 9 |
| 6.5 (AV-8B/TAV–8B only) | 1, 2, 3, 4, 5, 9 |
| 7 | 1, 2, 3, 4, 5 |
| 7.5 (F-35B only) | 1, 2, 3, 4, 5 |
| 7.5 (AV-8B/TAV-8B only) | 1, 2, 3, 4, 5, 6 |
| 9 | 1, 2, 3, 4, 5, 6 |
| **Note**<br>VTOL is authorized in front of or behind helicopters in accordance with the above. Helicopter(s) occupying the closest authorized spot(s) shall have blades stowed and secured or turning at flat pitch. Configuration is not dictated for other authorized spots. This table is applicable to H-1, H-3, H-53, H-60 class helicopters and V-22 class tiltrotors. | |

Figure E-2. Aircraft Launch/Recovery Spots Available with V−22 On Deck

| AIRCRAFT LAUNCH/RECOVERY SPOTS AVAILABLE WITH V-22 ON DECK WITH ROTORS TURNING PORT WINDS SHIP'S ROLL — GREATER THAN 4° | | |
|---|---|---|
| On-deck V-22 spot | H-47, H-53, Other V-22 | |
| | Launch from spot (3), (6) | Recover to spot (4), (5), (6) |
| 2 | 6, 7, 9 (2) | (1) |
| 4 | 7, 9 (2) | (1) |
| 5 | 9 (2) | (1) |
| 6 | −− | (1) |
| 7 | 2 | 2 (1) |

Figure E-2. Aircraft Launch/Recovery Spots Available with V−22 On Deck (cont.)

| AIRCRAFT LAUNCH/RECOVERY SPOTS AVAILABLE WITH V-22 ON DECK WITH ROTORS TURNING PORT WINDS SHIP'S ROLL — GREATER THAN 4° | | |
|---|---|---|
| **On-deck V-22 spot** | **H-47, H-53, Other V-22** | |
| | **Launch from spot (3), (6)** | **Recover to spot (4), (5), (6)** |
| 9 (2) | 2, 4 | 2, 4 |

Notes:
1. Aircraft may recover to any spot aft of a V-22.
2. Aircraft may launch with departure upwind of the on-deck V-22 as shown in table. Launches from spots aft of the on-deck V-22 are authorized provided their departures do not take them upwind of the on-deck V-22.
3. With V-22 turning on deck, aircraft may recover to any spot as shown in table.
4. Aircraft waving off shall do so as early as possible, and make a wide departure from the ship before turning upwind to minimize downwash effects to the V-22 turning on deck.
5. V-22 launch and recovery operations should not be conducted from spots immediately behind unsecured light or medium lift tail rotor aircraft. If V-22 launch and recovery operations are required from spots immediately behind unsecured light or medium lift tail rotor aircraft, consideration should be given to securing the aircraft with initial (four−point) tiedowns and increasing the wind over the deck.

## APPENDIX F

# Weapons Loading/Strikedown/ Downloading and Recovery Guide

### F.1 WEAPONS LOADING/STRIKEDOWN/DOWNLOADING AND RECOVERY GUIDE

In support of Chapters 6 and 9, Figure F-1 provides a list of weapons with associated restrictions that are approved for loading, strikedown, downloading, and/or recovery aboard LHA and LHD AV-8B/TAV-8B/F-35B/Helicopter/Tiltrotor Minimum Separation for VTOL Operations LHD/LHA-6 type ships.

Figure F-1. Weapons Loading/Strikedown/Downloading and Recovery Guide for LHA/LHD Type Ships

| WEAPON | HANGAR DECK | | RECOVERY (6) | |
|---|---|---|---|---|
| | LOAD | STRIKEDOWN/ DOWNLOAD | UNEXPENDED | HUNG |
| General Purpose Bombs/LGB/JDAM | Yes (3) (10) | Yes (4) | Yes (1) | Yes (1) |
| 20mm Guns | No | No | Yes | Yes |
| AGM-114 | No (2) | No (2) | Yes | Yes |
| JAGM: AGM-179 | No (2) | No (2) | Yes | Yes |
| AMRAAM (all) | No (2) | No (2) | Yes | Yes |
| 2.75/5.0 Rocket Launchers (all) | No | No | Yes | Yes |
| Aircraft Parachute Flare (LUU-2B/B) | Yes (8) | Yes (8) | Yes (8) | Yes (8) |
| Tube Loaded Flare Dispenser (loaded with LUU-2 flare) | Yes (8) | Yes (8) | Yes (8) | Yes (8) |
| 25-mm Gun Pods (7) | Yes | Yes (5) (9) | Yes | Yes |
| Rockeye II | Yes (3) | Yes (4) | Yes | Yes |
| Sidewinders (all) | No (2) | No (2) | Yes | Yes |
| Maverick (all) | No (3) | No (2) | Yes | Yes |
| Decoy Chaff/Flare (all) | No | No | Yes | Yes |
| Torpedos (all) | Yes (3) | Yes (4) | Yes | Yes |
| Marine Location Marker: MK-25/MK-58 | Yes (3) | Yes (3) | Yes | Yes |
| Practice Bombs (all) | Yes (3) | Yes (4) | Yes | Yes |
| JAU-22/B Cartridge | No (3) | No (7)(4) | Yes | Yes |
| Crew Serve Guns | No | No | Yes | Yes |

Figure F-1. Weapons Loading/Strikedown/Downloading and Recovery Guide for LHA/LHD Type Ships (cont.)

| WEAPON | HANGAR DECK | | RECOVERY (6) | |
|---|---|---|---|---|
| | LOAD | STRIKEDOWN/ DOWNLOAD | UNEXPENDED | HUNG |

Notes:

1. All applicable arming wires/safety clips/extractors/swivels intact.
2. Air-launched missiles shall not normally be loaded on the hangar deck except when operational commitments so dictate. Commanding officers may authorize loading of missiles on the hangar deck only up to the point of mechanical attachment of the weapon to the launcher/rack in accordance with the procedures prescribed in the appropriate NAVAIR Weapons/Stores Loading Checklists and Joint Technical Data.
3. Ejector cartridges shall not be installed on the hangar deck.
4. In the event of strikedown of a loaded aircraft to the hangar deck, ejector/jettison cartridges shall be removed, and F-35B internally loaded weapons shall be downloaded immediately after the aircraft is in spot and tied down.
5. The GAU-22, GPU-9/A Gun Pod (F-35B) is exempt from downloading requirements for up aircraft temporarily spotted in the hangar decks and aircraft undergoing limited maintenance, i.e., turnaround maintenance, providing compliance with all gun dearm procedures of the airborne weapons/stores loading manual, associated checklists, and Joint Technical Data have been accomplished.
6. Guidance provided in this appendix is subject to individual aircraft NATOPS/NATIP or tactical manual limitations.
7. Maintenance on Loaded Aircraft, Paragraph 10.1.10 applies.
8. Impulse cartridges must be removed from LUU-2 and dispenser with LUU-2.
9. Strikedown/download of aircraft with jammed 25-mm gun pods is prohibited.
10. No live ordnance shall be loaded in the F-35B weapons bay on the hangar deck.

## APPENDIX G

# NVD Training Syllabus for Ship's Personnel

### G.1 INTRODUCTION

To achieve the level of NVD proficiency expected in Chapters 2 and 9, a methodical building block approach to training and qualification of ship's personnel for operations with NVDs is essential. Ship's personnel involved in flight operations (Air Officers, LSOs, flight deck supervisors, LSEs, etc.) shall receive training orientation prior to conducting NVD operations. Remaining flight deck personnel requiring the use of NVDs in the performance of their duties shall attend NVD training coordinated through the ISIC with instructions according to TYCOM guidance. Classroom training can be scheduled through TYCOM (CNSP N42/CNSL N42) on an as needed basis. Approved LSE schools provide required classroom instruction. Additionally, USMC squadron Night System Instructors (NSIs) can provide classroom training.

**Note**

Whenever possible, initial stage 3 and 4 training should be conducted in .0022 lux or greater.

### G.2 STAGE ONE: NVD FAMILIARIZATION/CLASSROOM

Formal classroom instruction shall consist of the following:

1. NVD introduction.
2. Night/NVD physiology.
3. Environmental considerations and lighting requirements.
4. Aircrew tendencies on NVDs.
5. LSE signals and procedures (NVD and unaided).
6. Emergency procedures.
7. A night lab with a certified instructor should be utilized whenever available.

A static flight deck NVD orientation will be conducted for ship and flight deck personnel covering the following:

1. Lighting profiles/LSE wands.
2. LSEs with and without wands.
3. Procedural review by all supervisors.
4. Flight deck safety brief.

### G.3 STAGE TWO: SINGLE SPOT OPERATIONS/NVD LSE INITIAL QUALIFICATIONS

For qualification as an NVD LSE, all prerequisites (classroom and static deck) must be complete. The LSE shall direct five vertical takeoffs and landings and five touch and go's from the landing pattern while under the supervision of a qualified NVD LSE. This shall be accomplished under a high-light level of .0022 lux or greater. Ships requiring assistance of LSEs qualified in NVD operations for initial qualifications shall make requests through their ISIC. ISIC will coordinate with TYCOM as necessary.

**Note**

During stage two training, single spot operations are defined as no operating aircraft on forward and aft adjacent spots.

## G.4 STAGE THREE: MULTISPOT OPERATIONS

Multispot operations consist of two or more landing spots. The prerequisites are stages one and two completed. The LSE will direct six takeoffs and landings from the pattern while aircraft are operating from adjacent spots under the supervision of a qualified stage four NVD LSE.

**WARNING**

Landing forward or aft of an adjacent, occupied spot may be hazardous due to depth perception limitations associated with NVDs.

## G.5 STAGE FOUR: MULTIWAVE LAUNCH/RECOVERY OPERATIONS

Multiwave launch and recovery operations consist of a mix of aircraft in multiple waves operating from all spots. Stages one, two, and three must be complete. Final qualification and designation will be determined by the ship's commanding officer.

**WARNING**

Landing forward or aft of an adjacent occupied spot may be hazardous due to depth perception limitations associated with NVDs.

**Note**

The troops will be escorted to and from the aircraft in order to demonstrate the capability to move troops, equipment, and ordnance while operating in an NVD environment; however, this will not be done under completely darkened deck conditions. Overhead blue filtered light/dustpan lights (if available) will be used during troop movement, ordnance operations, fueling, etc.

## G.6 MAINTAINING NVD LSE QUALIFICATION

Each NVD LSE will attend 1 hour of classroom instruction or practical training on the NVDs after every 90 days of non-NVD operations. NVD LSE training will be logged and maintained in the individual LSE training record. The training should consist of but not be limited to the following subjects:

1. Lighting requirements.
2. LSE signals.
3. Aircrew tendencies.
4. Emergency procedures.

## G.7 SHIP QUALIFICATIONS

The ship's commanding officer will make a final determination of ship's ability to support NVD operations and report completion of stages of qualification to the ship's ISIC. Ships must maintain a minimum of five LSEs and two safety observers NVD qualified through stage four in order to maintain qualification.

## APPENDIX H

# Joint/Service (USA/USAF) Helicopters

### H.1 GENERAL

In support of the multiservice helicopter operations information addressed in Chapter 10, this appendix provides general information pertaining to shipboard operations with current Army and Air Force helicopters. It is designed to provide flight and hangar deck personnel an initial frame of reference when operating with these aircraft, and should by no means be considered a complete discussion of the topic. It should also not be considered a substitute for joint planning.

This section is not intended to restrict operations, but rather only to provide guidance. The use of mandatory language has been purposely kept to a minimum.

Regardless of apparent exterior similarities, USA/USAF helicopters were not designed with the shipboard environment in mind, and differ significantly in key areas from their USN/USMC counterparts:

1. Most do not have rotor brakes. Rotor blades spend significantly more time at low rpm during start-up and coast down.
2. Many do not have rotor anti-flap restraints, further increasing the risk of flapping-induced damage while stationary or at low rpm.
3. Only the MH-53 has an automatic blade fold system. Folding H-47 aircraft is an extremely maintenance-intensive evolution. AH-64 aircraft have no provisions for folding rotor blades.
4. Blade fold systems are designed for aircraft transport only, and do not adequately protect the blades from damage from wind and/or rotor wash.
5. Aircraft tiedown points are not designed to meet shipboard requirements for strength, access and minimum numbers.
6. Most aircraft are not equipped with TACAN.
7. Many aircraft systems are susceptible to electro-magnetic interference from shipboard transmitters.
8. Many USA/USAF helicopter weapons systems do not meet shipboard certification requirements.
9. AH/MH-6J and OH-58D helicopters, due to their light weight and skid-type landing gear, are susceptible to sliding due to deck motion, wind and rotor wash.
10. Most Army helicopters are not equipped with TACAN or UHF homing receivers, but are capable of HF homing. The use of shipboard continuous wave HF transmissions for aircraft navigation should be considered when operating with these aircraft. Prior coordination is required.

Operational requirements may preclude interfacing with assigned USA/USAF embarked units prior to conducting joint operations. However, it is highly recommended that ship personnel interface with embarked unit personnel as early as feasible prior to embarking joint helicopters to minimize problems at sea.

## H.2 H-60 MODEL HELICOPTERS

### H.2.1 Basic Capabilities and Characteristics

All versions are based on the basic Army UH-60 Black Hawk helicopter, with 4-bladed main and tail rotors, 2 T700-GE-700/701C series engines with APU, non-retractable landing gear with 2 main wheels and a castering tailwheel, and 2 sliding cargo doors.

1. Crew.

Crews consist of 2 pilots (minimum crew), plus a crewchief and/or mission specialists, and aerial gunner(s) as required.

#### H.2.1.1 UH-60A/L Utility Helicopter/UH-60Q/HH-60L MEDEVAC Helicopter

1. Shipboard Operations Capability.
   a. No rotor brake (up to 8+ minutes rotor coast down).
   b. Manual blade fold (20 to 30 minutes under optimum conditions).
   c. Manual tail fold (lengthy maintenance action, impractical for operational use).
   d. Pressure refueling (except external tanks).
   e. No TACAN (UH-60A/L).
   f. TACAN (UH-60Q/HH-60L MEDEVAC Only).
   g. UHF.
   h. APU.
2. Mission.

The “A” series is the basic Army utility helicopter used for tactical transport of troops, medical evacuation, cargo and reconnaissance. The “L” series is the same, but equipped with upgraded engines and transmission for improved performance, plus a higher capacity external cargo hook.

The “Q” series is a UH-60A modified with extensive medical equipment and additional avionics and FLIR, used for medical evacuation, transport of medical teams and supplies, as well as provide support for combat search and rescue.

**Note**

The UH-60Q exists in extremely small numbers. The HH-60L is its replacement and has only begun production. HH-60L features may be different than stated in this document. All H-60 models can conduct medical evacuation missions and may even have a medical Red Cross insignia. H-60 aircraft conducting MEDEVAC missions are not necessarily a UH-60Q or HH-60L.

3. Mission Equipment.
   a. External cargo hook.
   b. External Stores Support System (ESSS) with 4 stores pylons for external fuel tanks.
   c. Two window-mounted M60D 7.62 mm machine guns (UH-60A/L only).
   d. Volcano Multiple Mine Delivery System (UH-60A/L only).
   e. Forward Looking Infrared (FLIR) (UH-60Q/HH-60L MEDEVAC only).

f. Medical Evacuation (MEDEVAC) System (UH-60Q/HH-60L MEDEVAC Only).

(1) Litter lift system.

(2) Ambulatory patient configuration.

(3) Medical stations.

(4) Medical cabinets.

(5) Lighting systems.

(6) Provisions to support IV bags.

(7) Medical suction system.

(8) Oxygen delivery system.

(9) Outlets for 28VDC and 115VAC 60 cycle electrical power.

4. SAR Capability.

Some UH-60A/L helicopters are capable of fitting an electric hoist kit (only available to units with a dedicated SAR/MEDEVAC mission). Rafts may be carried.

UH-60Q and HH-60L MEDEVAC helicopters are equipped with an electrically powered externally mounted hoist. Swimmers and/or rafts may also be carried.

5. Dimensions (see Figure H-1).

a. Spread (rotors turning): 64'10”L / 53'8”W / 16'10”H.

b. Folded (no ext. tanks): 54'8”L / 14'4”W / 16'10”H.

c. Folded (ext. tanks): 54'8”L / 21'W / 16'10”H.

d. Spot factor (LHA/LHD): 5.19 (spread); 1.60 (folded with ext. tanks).

6. Weight.

a. Empty (no fuel, no crew): 12,000 lbs.

b. Operating (internal fuel, crew, no cargo): 15,000 lbs.

c. Max gross on deck: 22,000 lbs.

d. Max gross on deck (ferry only): 24,500 lbs.

7. Fuel/Quantity.

a. Primary fuel: JP-8.

b. Alternate fuel: JP-5/JP-4.

c. Max internal: 360 gals/2,450 lbs.

d. Max external: 920 gals in 230 gal tanks/6,250 lbs.

e. Max total: 1,280 gals/8,700 lbs.

8. Ordnance.

a. UH-60A/L: two M60D 7.62 mm machine guns, mounted in gunners' windows on each side of the aircraft.

b. UH-60Q/HH-60L MEDEVAC: not armed.

c. Chaff/flares.

d. CADs for engine fire extinguishers, cargo hook, rescue hoist cable cutter, stores jettison, chaff/flares.

9. Internal Lift Capability.
   a. UH-60A/L: maximum of 14 seats for crew and troops, up to 9,500 lbs. internal cargo, less than 300 lbs/$ft^2$ on cabin floor.
   b. UH-60Q/HH-60L MEDEVAC: 6 Litters and 3 seats for crew and patients or 9 seats in the ambulatory patient configuration.
10. External Lift Capability.
    a. UH-60A and UH-60Q: 8,000 lbs.
    b. UH-60L and HH-60L: 9,000 lbs.
11. Comm/Nav Equipment.
    a. UHF.
    b. VHF (AM/FM).
    c. HF (not all).
    d. Have Quick/Have Quick II.
    e. SINCGARS.
    f. LF ADF.
    g. VOR/ILS.
    h. TACAN (UH-60Q/HH-60L MEDEVAC only).
    i. Doppler/GPS or INS.
    j. VHF-FM Homing.
    k. Personnel Locator System (UH-60Q/HH-60L MEDEVAC only).

#### H.2.1.2 MH-60K Assault Helicopter

1. Shipboard Operations Capability.
   a. Rotor brake.
   b. Manual blade fold (10 to 20 minutes under optimum conditions).
   c. Manual stabilator fold (10 minutes, impractical for daily use).
   d. Manual tail fold (lengthy maintenance action, impractical for operational use).
   e. Axle tiedown rings (outboard of main landing gear wheels).
   f. Pressure refueling (except external tanks).
   g. TACAN.
   h. UHF.
   i. APU.
2. Mission.

The MH-60K Special Operations helicopter is used to insert special operations forces and cargo into hostile landing zones during day, night and adverse weather conditions over long distances.

3. Mission Equipment.
   a. Removable aerial refueling probe.

b. External cargo hook.

c. External Tank System (ETS) with 2 pylons for external fuel tanks.

d. Two window-mounted M134 7.62 mm miniguns.

e. Fast Rope Insertion/Extraction System (FRIES).

4. SAR Capability.

An optional external hoist may be installed. Swimmers and/or rafts may also be carried.

5. Dimensions (see Figure H-3).

a. Spread (rotors turning): 64'10"L / 53'8"W / 16'10"H.

b. Folded (w/ext. tanks, no probe): 54'8"L / 17'11"W / 16'10"H.

c. Folded (w/ext. tanks, probe): 60'7"L / 17'11"W / 16'10"H.

d. Spot factor (LHA/LHD): 5.19 (spread); 1.52 (folded w/ext. tanks).

6. Weight.

a. Empty (no fuel, no crew): 13,500 lbs.

b. Operating (internal fuel, crew, no cargo): 18,000 lbs.

c. Max gross on deck: 24,500 lbs.

7. Fuel/Quantity.

a. Primary fuel: JP-8.

b. Alternate fuel: JP-5/JP-4.

c. Max internal: 360 gals/2,450 lbs.

d. Max auxiliary internal: up to 340 gals/2,300 lbs.

e. Max external: 460 gals (2 x 230 gal tanks)/3,130 lbs.

f. Max total: 1,160 gals/7,880 lbs.

8. Ordnance.

a. Two M134 7.62 mm miniguns, mounted in gunners' windows on each side of the aircraft.

b. Chaff/flares.

c. CADs for engine fire extinguishers, cargo hook, rescue hoist cable cutter, external stores jettison, chaff/flare dispensers.

9. Internal Lift Capability.

Maximum of 14 seats for crew and troops, up to 9,500 lbs. internal cargo, less than 300 lbs/$ft^2$ on cabin floor.

10. External Lift Capability.

a. Up to 8,000 lbs.

11. Comm/Nav Equipment.

a. SATCOM.

b. UHF.

c. VHF (AM/FM).

d. HF.

e. Have Quick.

f. Have Quick II.

g. SINCGARS.

h. TACAN.

i. Doppler/GPS/INS.

j. VOR/ILS.

k. LF ADF.

l. Personnel Locator System.

### H.2.1.3 MH-60L/MH-60L IDAP Assault Helicopter

1. Shipboard Operations Capability.

   a. No rotor brake (up to 8+ minutes rotor coast down).

   b. Manual blade fold (10 to 20 minutes under optimum conditions).

   c. Manual stabilator fold (10 minutes, impractical for daily use).

   d. Manual tail fold (lengthy maintenance action, impractical for operational use).

   e. Axle tiedown rings (outboard of main landing gear wheels).

   f. Pressure refueling (except external tanks).

   g. TACAN.

   h. UHF.

   i. APU.

2. Mission.

Figure H-1. MH-60K Dimensions

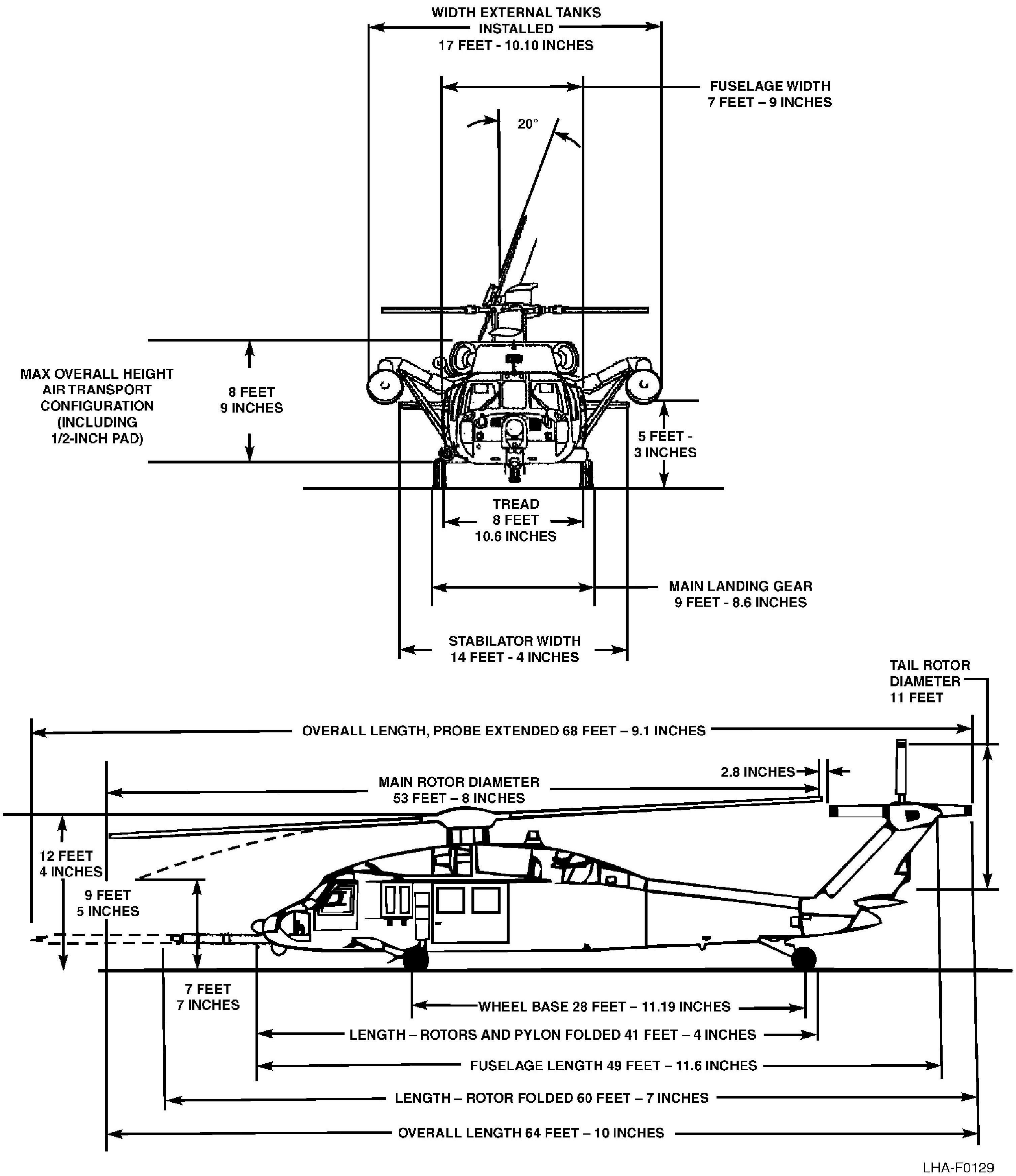
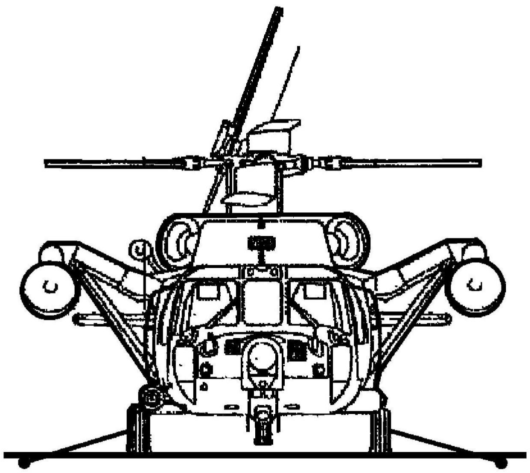


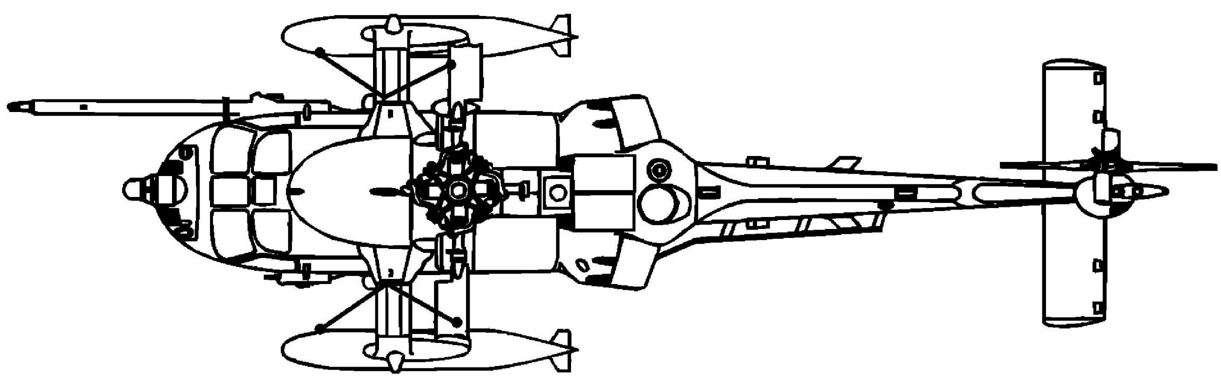
Figure H-2. MH-60K Initial Tiedown Configuration (Recommended)



TIEDOWN FITTINGS ARE LOCATED ON THE MAIN LANDING GEAR AXLES, DRAG BEAM, FORWARD UPPER FUSELAGE, TAIL TRANSITION AREA AND FORWARD OF THE TAIL WHEEL.

INITIAL TIEDOWNS SHOULD BE INSTALLED ON THE MAIN LANDING GEAR AXLES.

THESE RECOMMENDED CONFIGURATIONS ARE BASED ON JSHIP ANALYSIS. THEY ARE NOT DIRECTIVE IN NATURE.



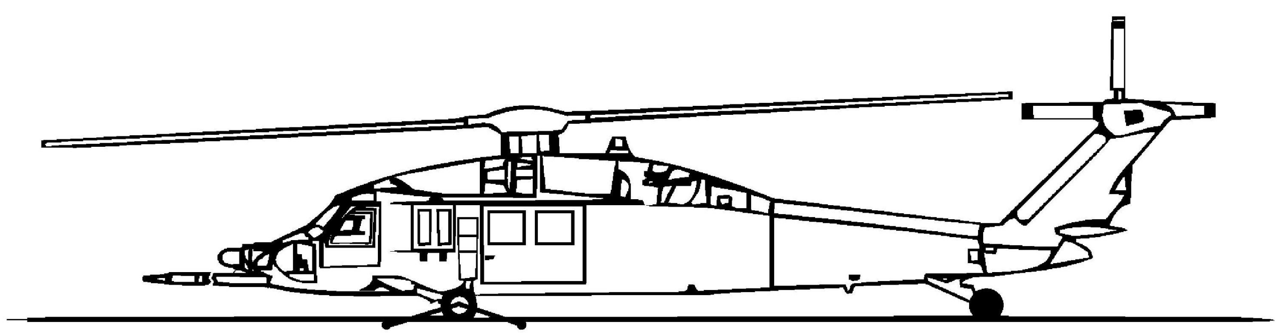


Figure H-3. UHH-60A/L/Q Dimensions

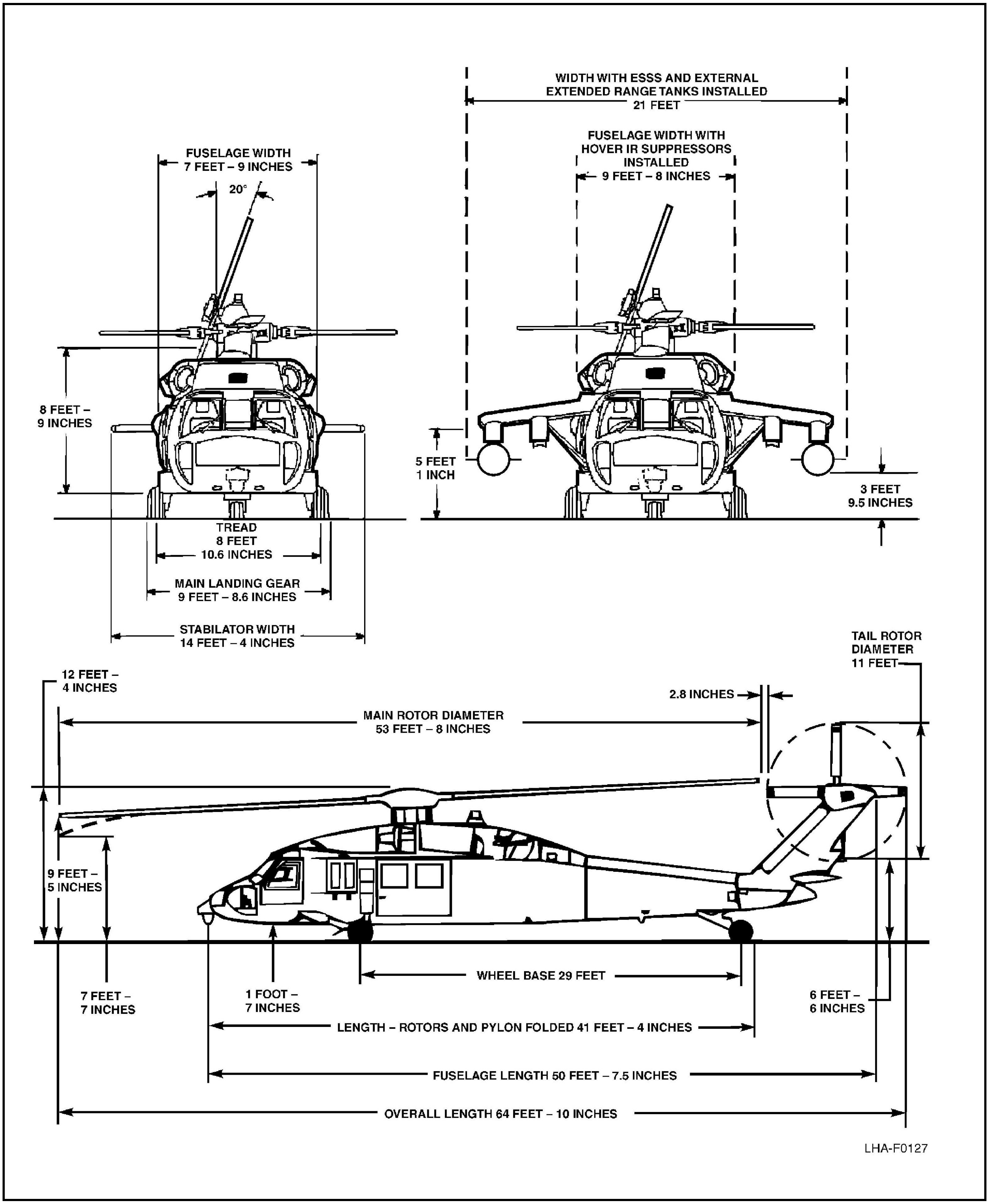
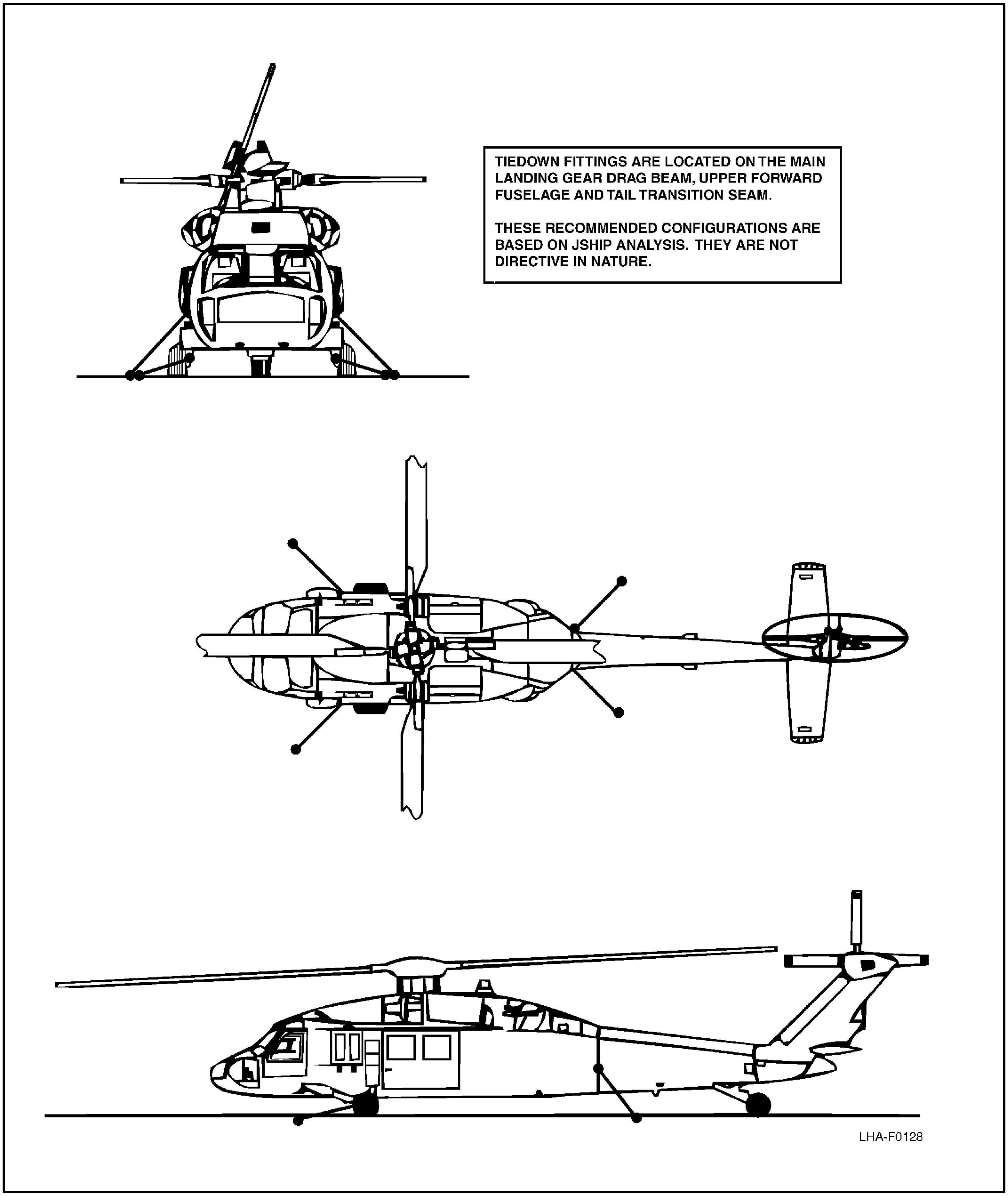


Figure H-4. U/HH-60A/L/Q Initial Tiedown Configurations (Recommended)



The MH-60L is used to insert special operations forces and cargo into hostile landing zones during day, night and adverse weather conditions over long distances. The Integrated Defensive Armed Penetrator (IDAP) version provides extensive ordnance capabilities.

3. Mission Equipment.
   a. Removable aerial refueling probe.
   b. External cargo hook.
   c. External Stores Support System (ESSS) with 4 stores pylons or External Fuel System (EFS) with 2 stores pylons for external fuel tanks and/or ordnance.
   d. Two window-mounted M134 7.62 mm miniguns.
   e. Fast Rope Insertion/Extraction System (FRIES).
4. SAR Capability.

An optional external hoist may be installed. Swimmers and/or rafts may also be carried.

5. Dimensions (see Figure H-5).
   a. Spread (rotors turning): 64'10"L / 53'8"W / 16'10"H
   b. Folded (w/ESSS, no probe): 54'8"L / 20'2"W / 16'10"H
   c. Folded (w/ESSS, probe): 60'7"L / 20'2"W / 16'10"H
   d. Spot factor (LHA/LHD): 5.19 (spread); 1.55 (folded w/ESSS)
6. Weight.
   a. Empty (no fuel, no crew): 12,500 lbs.
   b. Operating (internal fuel, crew, no cargo): 16,000 lbs.
   c. Max gross on deck: 23,500 lbs.
7. Fuel/Quantity.
   a. Primary fuel: JP-8.
   b. Alternate fuel: JP-5/JP-4.
   c. Max main internal: 360 gals/2,450 lbs.
   d. Max auxiliary internal: up to 958 gals/6,510 lbs.
   e. Max external: 460 gals (2 x 230 gal tanks)/3,130 lbs.
   f. Max total: 1,778 gals/12,100 lbs.
8. Ordnance.
   a. Base MH-60L: two M134 7.62 mm miniguns, mounted in gunners' windows on each side of the aircraft.
   b. Chaff/flares.
   c. MH-60L (IDAP) additional armament.
      (1) HELLFIRE missiles.
      (2) 30 mm cannon.
      (3) 7.62 mm miniguns.
      (4) 40 mm gun.
      (5) 2.75" rockets.

(6) Air-to-Air Stinger (ATAS) missiles.

(7) Sidewinder missiles.

(8) SIDEARM.

d. CADs for engine fire extinguishers, cargo hook, rescue hoist cable cutter, external stores jettison, chaff/flare dispensers.

9. Internal Lift Capability.

Maximum of 14 seats for crew and troops, up to 9,500 lbs. internal cargo, less than 300 lbs/ft$^2$ on cabin floor.

10. External Lift Capability.

a. Maximum of 9,000 lbs.

11. Comm/Nav Equipment.

a. SATCOM.

b. UHF.

c. VHF (AM/FM).

d. HF.

e. Have Quick.

f. Have Quick II.

g. SINCGARS.

h. TACAN.

i. Doppler/GPS.

j. VOR/ILS.

k. ADF.

l. Personnel Locator System.

Figure H-5. MH-60L Dimensions

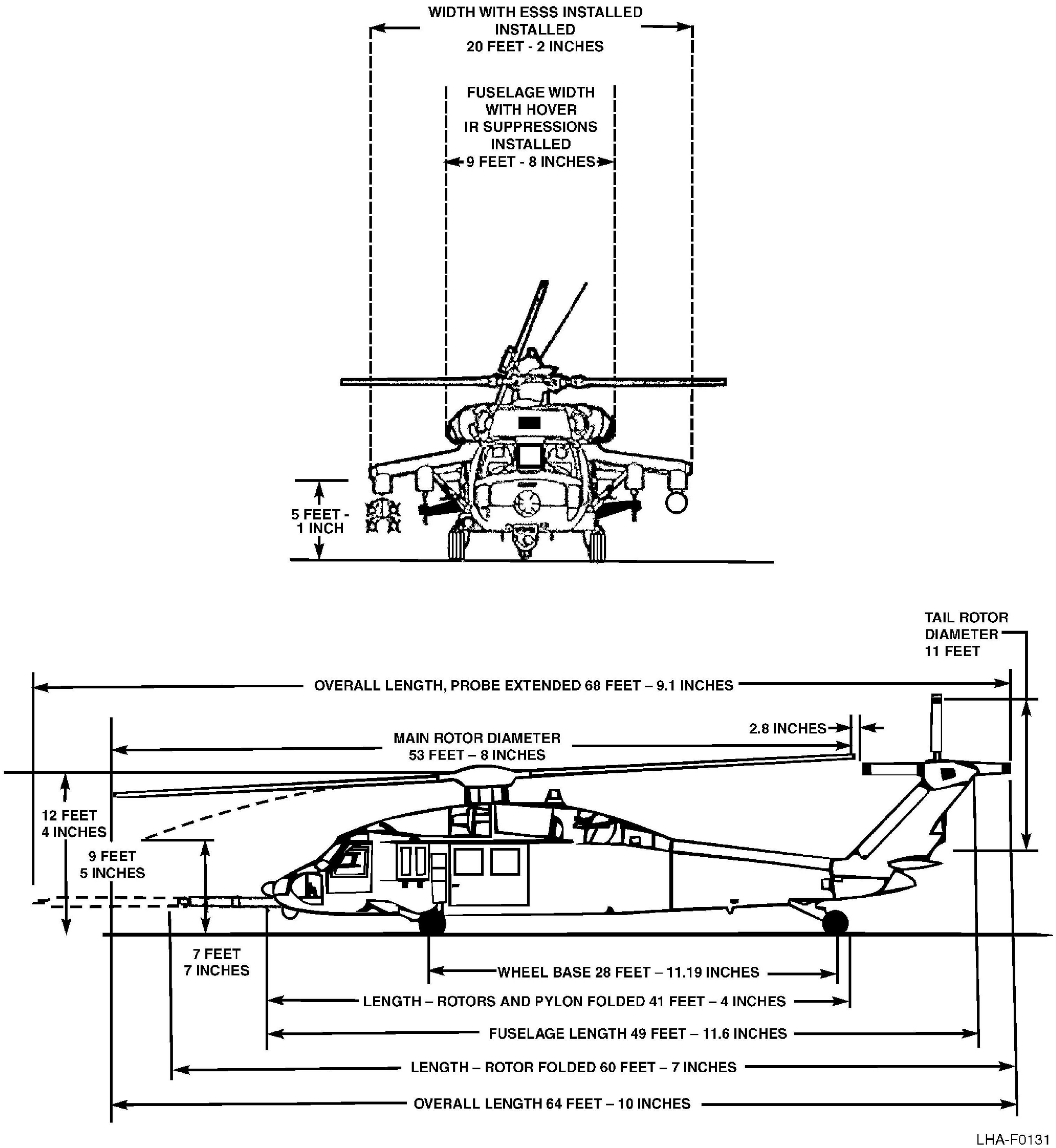
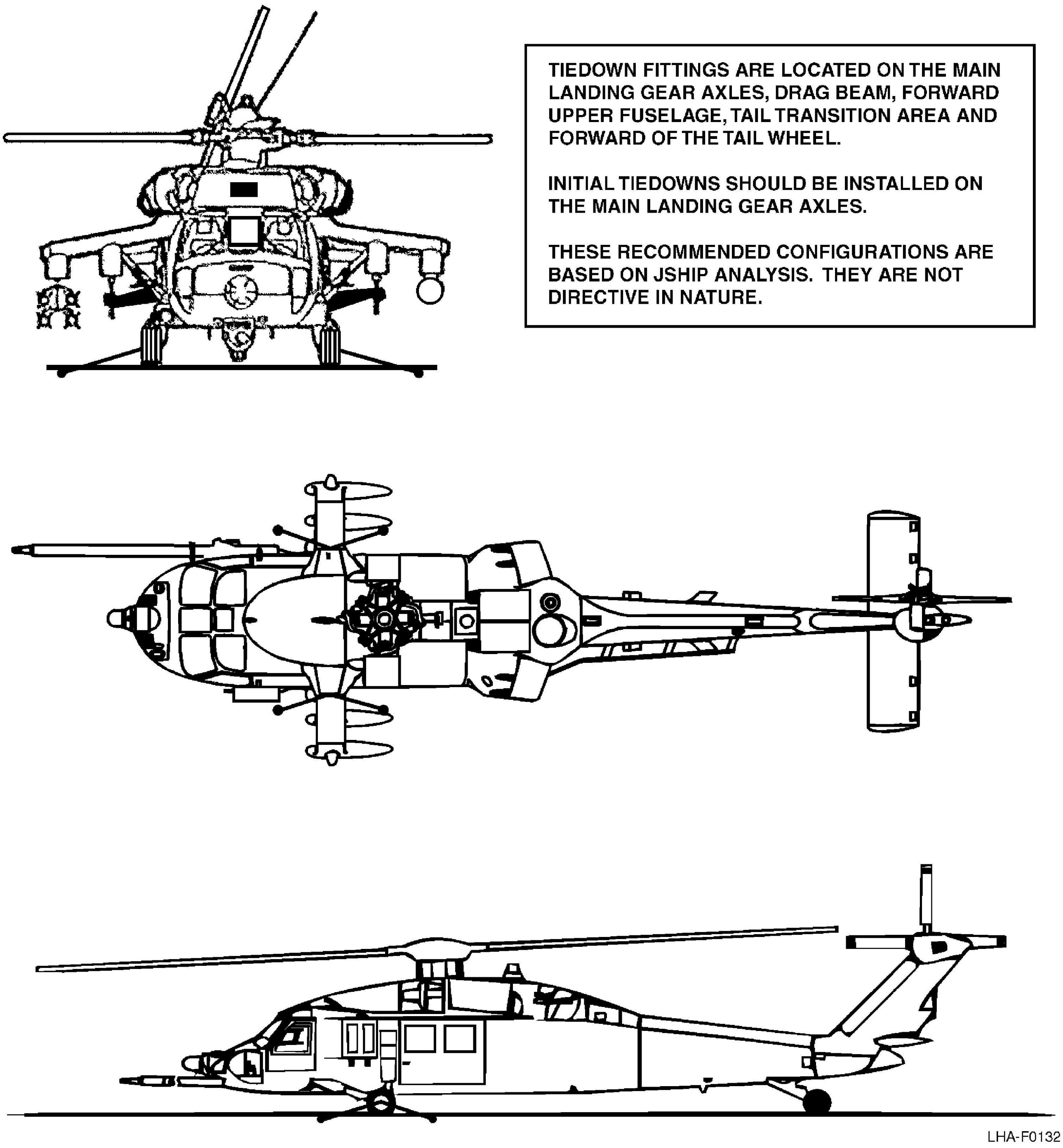


Figure H-6. MH-60L Initial Tiedown Configurations (Recommended)



### H.2.1.4 HH-60G Assault Helicopter

1. Shipboard Operations Capability.
   a. Rotor brake (airframe mod, not universally installed).
   b. Manual blade fold (10 to 20 minutes under optimum conditions).
   c. Manual tail fold (lengthy maintenance action, impractical for operational use).
   d. Pressure refueling.
   e. TACAN.
   f. UHF.
   g. APU.
2. Mission.

The Air Force HH-60G helicopter is used to search, locate and recover combat aircrew members and is capable of other missions across the full spectrum of operations.

3. Mission Equipment.
   a. Removable aerial refueling probe.
   b. External cargo hook.
   c. Fast Rope Insertion/Extraction System (FRIES).
   d. Two window--mounted GAU--2B/A 7.62 mm miniguns. Some aircraft may have .50 cal machine gun installed in aft cargo area.
4. SAR Capability.

Full over-water SAR capability — external hoist, swimmer, rescue devices (swimmer carried only when designated as SAR aircraft).

5. Dimensions (see Figure H-7).
   a. Spread (rotors turning): 64'10"L / 53'8"W / 16'10"H.
   b. Folded (no probe): 54'8"L / 14'4"W / 16'10"H.
   c. Folded (w/probe): 60'7"L / 14'4"W / 16'10"H.
   d. Spot factor (LHA/LHD): 5.19 (spread); 1.52 (folded).
6. Weight.
   a. Empty (no fuel, no crew): 14,500 lbs.
   b. Operating (fuel, crew, no cargo): 19,000 lbs.
   c. Max gross on deck: 22,000 lbs.
7. Fuel/Quantity.
   a. Primary fuel: JP-8.
   b. Alternate fuel: JP-5/JP-4.
   c. Max internal: 360 gals/2,450 lbs.
   d. Max auxiliary internal: up to 370 gals/2,520 lbs.
   e. Max total: 730 gals/4,970 lbs.

8. Ordnance.

   a. GAU-2B/A 7.62 mm miniguns mounted in gunners' windows on each side of the aircraft. Some aircraft may have .50 cal machine gun installed in aft cargo area.

   b. Two optional GAU-18/A .50 cal machine guns mounted in cabin window on each side of the aircraft.

   c. Chaff/flares.

   d. CADs for engine fire extinguishers, cargo hook, rescue hoist cable cutter, chaff/flare dispensers.

9. Internal Lift Capability.

Maximum of 14 seats for crew and troops, up to 9,500 lbs. internal cargo, less than 300 lbs/ft$^2$ on cabin floor.

10. External Lift Capability.

Not normally configured with cargo hook (hook capacity 8,000 lbs. when installed).

11. Comm/Nav Equipment.

    a. SATCOM.

    b. UHF.

    c. VHF (AM/FM).

    d. HF.

    e. Have Quick.

    f. Have Quick II.

    g. TACAN.

    h. Doppler/INS/GPS.

    i. VOR/ILS.

    j. ADF.

    k. Lightweight Airborne Recover System (LARS) (same as Army Personnel Locator System).

Figure H-7. HH-60G Dimensions

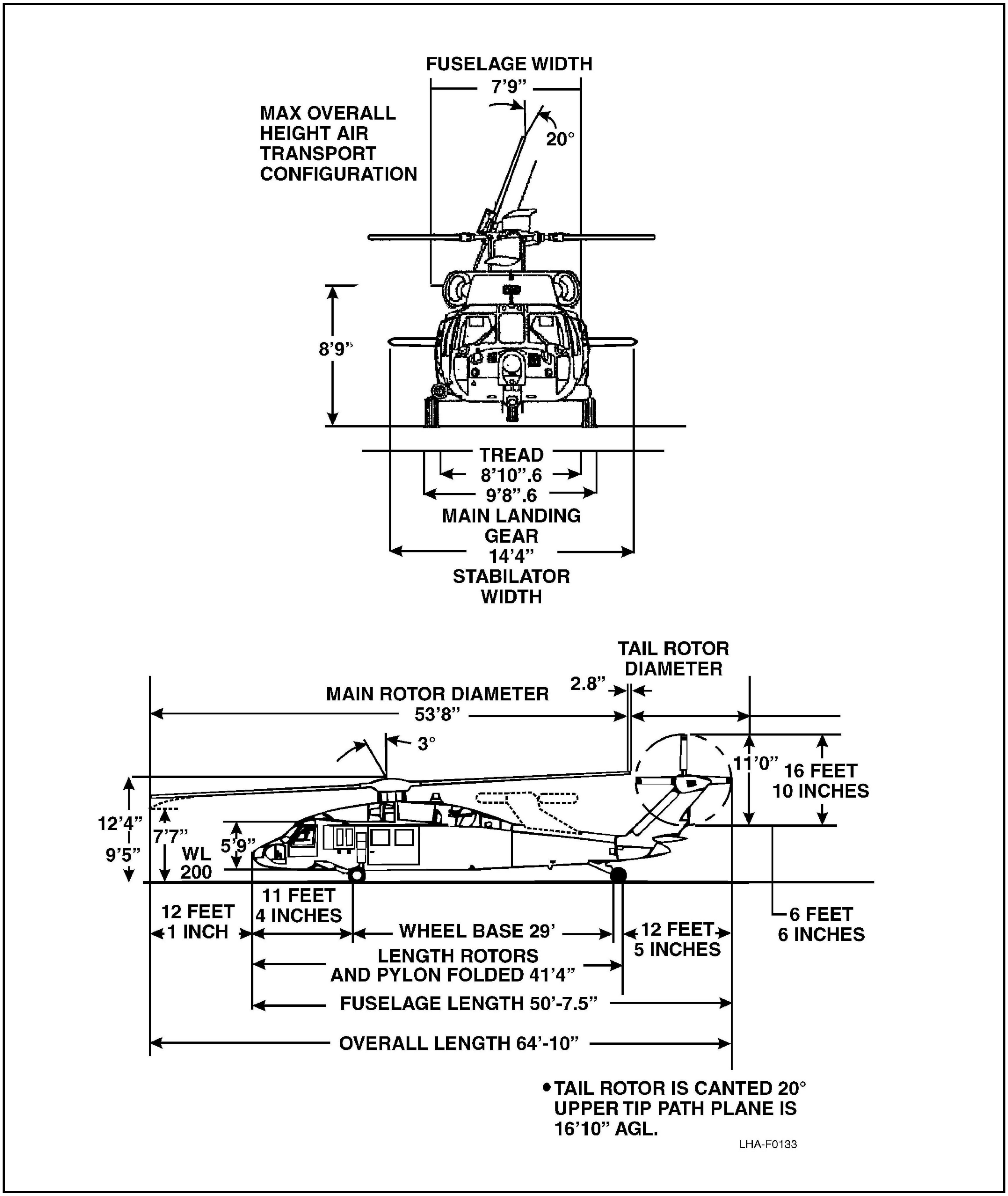
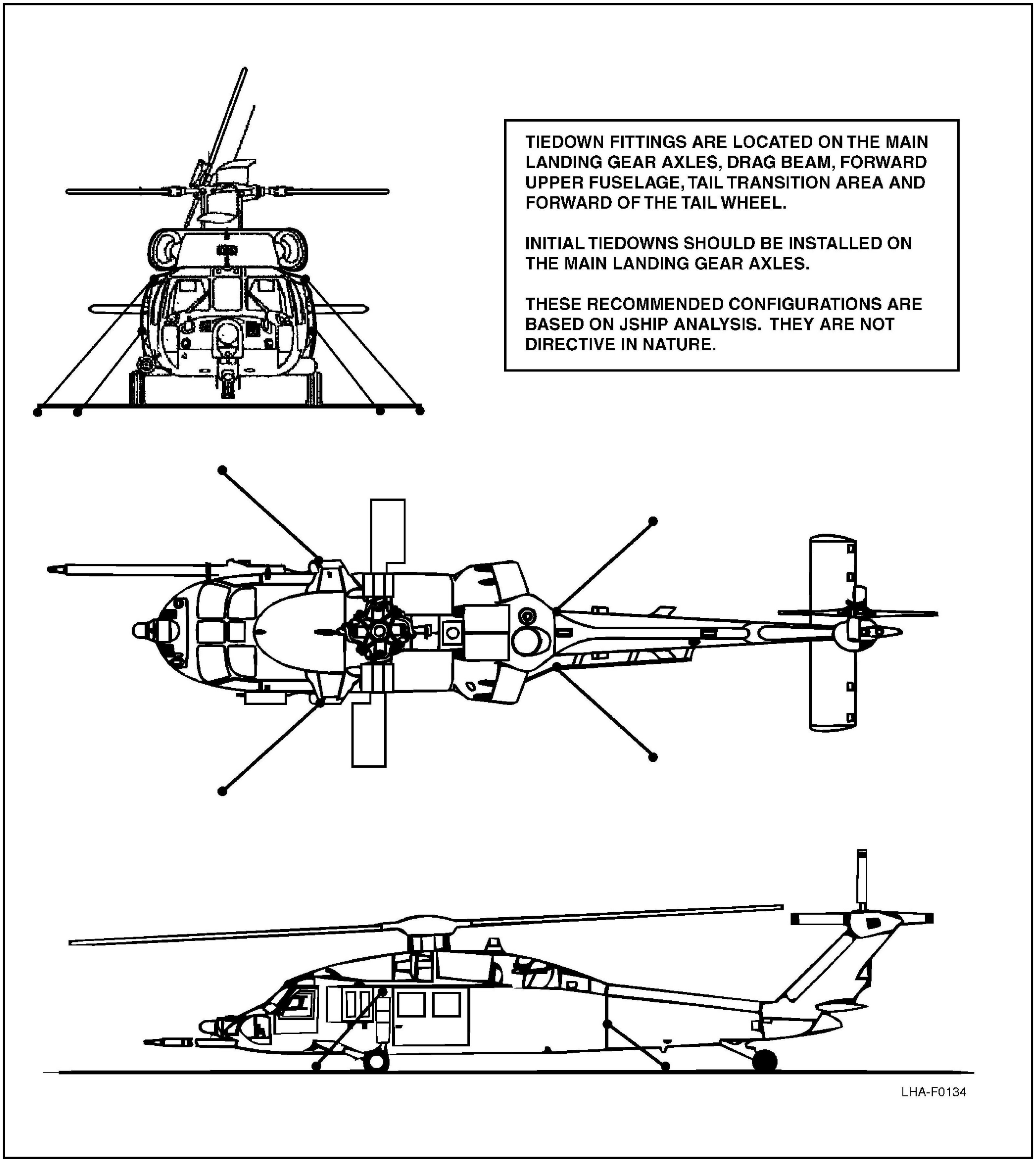


Figure H-8. HH-60G Initial Tiedown Configurations (Recommended)



## H.2.2 H-60 Operational Considerations

### H.2.2.1 Navigation to Ship (UH-60A/L Only)

Conventional Army UH-60A/L helicopters are not equipped with TACAN and may require escort and/or radar vectors to navigate to the ship.

### H.2.2.2 ADF Steering to Ship

Army/Air Force H-60 helicopters are capable of receiving HF transmissions and using them for ADF steering to the ship. The ship's HF transmitter must be set for continuous-wave transmission of a single frequency signal between 2,000 to 2,199 kHz at a power level of approximately 50 watts. Ships should coordinate with units to provide a HF signal that will aid in navigation to the ship.

### H.2.2.3 Chaining (UH-60A/L/Q, HH-60G, Some MH-60L)

**WARNING**

Army H-60 main landing gear tiedown rings are located on the lower part of the drag strut inboard of the wheels, requiring deck crew to reach around in front of the wheel to attach chains. Vigilance must be exercised when attaching chains to avoid rollover by the helicopter wheels.

**Note**

All MH-60K's and some MH-60L's also have tiedown rings on the main landing gear axle ends, similar to the Navy SH-60B/F.

### H.2.2.4 Chocking with Inboard-Mounted External Stores (UH-60A/L/Q, MH-60L)

**WARNING**

Inboard mounted external fuel tanks or stores on Army H-60 aircraft significantly impede access to the main wheels, exposing flight deck personnel to risk of injury in the event of inadvertent jettison or aircraft movement while chocking. Consideration should be given to safing the external stores jettison circuits prior to chocking, balanced with the need to expeditiously chock and chain the aircraft to prevent movement under severe deck motion conditions. Consideration should also be given to not carrying inboard mounted tanks or stores when severe deck motion conditions are likely to be encountered.

#### H.2.2.5 Blade Flapping During Rotor Coast Down and Start-up (UH-60A/L/Q, MH-60L, Some HH-60G)

**WARNING**

Most Army/Air Force H-60 helicopters are not equipped with rotor brakes; rotor blades begin turning upon engine startup. Extended rotor coast down times can be expected. These times can vary with relative wind speed and direction, and can exceed 8 minutes in winds as light as 20 knots. During rotor start and coast down, changing wind conditions, gusts, flight deck turbulence and rotor downwash from other helicopters can create excessive blade flapping and cause aircraft damage. Relative crosswinds that create strong updrafts at the ship's deck edge are especially conducive to excessive blade flapping, and should be avoided. Non rotor brake-equipped H-60 helicopters are more susceptible to flapping than typical Navy helicopters. Extreme caution should be exercised when starting or shutting down these helicopters on board ship. The ship should treat start and shutdown of H-60 helicopters as if they had a rotor brake failure and be ready to provide optimum winds for the start or windmilling stop of the rotor system.

**Note**

Army H-60 helicopters, with the exception of the MH-60K, do not have rotor brakes. Air Force HH-60G helicopters are not universally equipped with rotor brakes.

#### H.2.2.6 Static Blade Flapping and Tiedown

**CAUTION**

Army/Air Force H-60 rotor blades are susceptible to static blade flapping, especially if blades are unrestrained and over the water in relative crosswinds that create strong updrafts at the ship's deck edge.

**Note**

USA/USAF H-60 rotor blades cannot be folded quickly and should be tied down immediately after shutdown. Tiedown of H-60 blades requires pins to be inserted near the blade tips. If blades are hanging over the deck edge, their tiedown will be more difficult and time-consuming, requiring rotation of the blades. Ships should provide optimum wind conditions during shut down of H-60 helicopters until all blades are tied down.

#### H.2.2.7 Spotting During Blade Fold/Spread

Folding or spreading of USA/USAF H-60 main rotor blades requires the aircraft to be spotted with the blade arc over the deck. This is to allow crewmen to support the blades at their ends with a pole while walking the blades around to their folded or spread position. When spotted on LHA or LHD marked spots, H-60 rotor blades will extend over water.

### H.2.2.8 Main Rotor Blade Fold/Spread

**CAUTION**

Unlike the Navy SH-60, folding or spreading of Army/Air Force H-60 main rotor blades is a manual operation. The effects of wind speed and direction, combined with ship motion, can adversely affect the ability of crewmen to control the blades. Crews must exercise extreme caution when folding or spreading blades in high wind/deck motion conditions.

**Note**

H-60 units have experienced increased difficulties physically controlling the rotor blades when folding or spreading in winds exceeding 30 knots, especially when gusting. The ship should be ready to provide optimum wind and deck motion conditions for folding of the USA/USAF UH-60 rotor system.

### H.2.2.9 Time to Fold/Spread Rotors

Folding or spreading of USA/USAF H-60 main rotor blades is a manual operation, significantly affected by wind, ship motion conditions, material condition of the helicopter, and experience of the crew. Recorded fold times have ranged from as little as 10 minutes for an experienced crew to 80 minutes for an inexperienced crew. Recorded spread times have ranged from 10 minutes for an experienced crew to 58 minutes for an inexperienced crew. Time for manually folding and spreading main rotor blades should be taken into account for tactical planning.

### H.2.2.10 Susceptibility to Damage with Rotors Folded

**CAUTION**

Unlike the Navy SH-60, the current Army/Air Force H-60 blade fold system is not designed to protect against winds. Helicopter launch/recovery operations adjacent to folded USA/USAF H-60 aircraft should not be conducted. The folded H-60 main rotor blades can contact each other causing damage. H-60 main rotor blades can also be damaged by high winds and/or ship motion in the folded configuration.

### H.2.2.11 Tail Fold Limitations

Unlike the Navy SH-60, the Army/Air Force H-60 tail fold system is a maintenance operation designed for use during long term storage or logistic transportation, and is not intended for routine operational use. Do not expect Army/Air Force H-60 units to tail fold when aboard ship.

### H.2.2.12 Stabilator Folding (MH-60K/L, HH-60G)

Like the Navy SH-60, the Army MH-60K/L and Air Force HH-60G have a folding stabilator. The simple manual operation requires the use of a special tool to remove a pin on each side of the stabilator center section allowing the outboard sections of the stabilator to be folded up parallel to the vertical tail. Fixed support links are installed between the pins and stabilator to hold the stabilator section in the vertical position. Folding stabilators are not found on UH-60A/L/Q or HH-60L helicopters.

### H.2.2.13 Handling — Tailwheel Locking Mechanism

**CAUTION**

When moving USA/USAF H-60 helicopters, the tailwheel locking mechanism should be disengaged prior to attaching the towbar. During towing, the manual H-60 tailwheel locking mechanism is susceptible to re-engaging, which could result in shearing of the lockpin. Tow crews should use a suitable device (grounding clamp, etc.) to hold the system's mechanical stop in the unlocked position as the aircraft is towed.

### H.2.2.14 Handling — Tailwheel Locking Mechanism Engagement

**CAUTION**

Manually rotating the tailwheel of Army and Air Force H-60 helicopters while the parking brake is set and then engaging the manual tail wheel locking system can result in binding and/or shearing of the lockpin. The parking brake should not be set when engaging the lockpin.

### H.2.2.15 Compatibility with SD-2 Spotting Dolly

The SD-2 spotting dolly may be used to maneuver USA/USAF H-60 aircraft. Prior to raising or lowering the helicopter, the tail wheel must be aligned within 45° of the aircraft's longitudinal axis. Once the tail wheel is raised, the SD-2 can operate up to ±90° from the aircraft's longitudinal axis.

**CAUTION**

When maneuvering USA/USAF H-60 aircraft with the SD-2, caution must be exercised to ensure that the rotational limits of the SD-2 lifting arms are not exceeded, causing damage to the aircraft or the SD-2.

### H.2.2.16 Fuel Sampling

**CAUTION**

To take fuel samples from Army/Air Force H-60 helicopters, the gravity fuel port must be opened and remain open while taking the sample. The ship's motion may cause fuel to spill from the open gravity fuel port. Proper precautions should be taken.

### H.2.2.17 Refueling Extended Range Fuel System External Tanks (UH-60A/L/Q, MH-60L)

Most Army H-60 external Extended Range Fuel System (ERFS) tanks can only be gravity refueled, which requires the aircraft to be shutdown when refueling aboard ship. Therefore, refueling operations for helicopters carrying external ERFS tanks require more time than refueling operations for Navy H-60 helicopters with external tanks. Recorded turnaround times for refueling of ERFS-equipped H-60 helicopters range from 25 to 28 minutes. If H-60 aircraft are configured with external tanks, extended turnaround times should be taken into consideration when performing operations planning.

### H.2.2.18 Electromagnetic Vulnerability

**WARNING**

Various shipboard transmitters can adversely affect non-Navy helicopters. When conducting joint shipboard helicopter operations, consideration must be given to potential Radiation Hazards (RADHAZ), electromagnetic interference, and electronic vulnerability effects so that applicable transmitter conditions can be set prior to the non-Navy helicopter(s) arrival aboard the ship.

## H.3 H-47 MODEL HELICOPTERS

### H.3.1 Basic Capabilities and Characteristics

The base Army H-47 Chinook model has 2 tandem counter-rotating 3-bladed rotors, 2 T55-L-712 or T55-GA-714A engines and an APU, four non-retractable landing gear with 2 twin-wheel forward landing gear and 2 single-wheel full swivel aft landing gear, a rear cargo ramp and forward cabin door and window.

1. Crew.

Minimum crew consists of 2 pilots and 1 flight engineer. Typical crew includes an additional crewchief and gunners, as required.

### H.3.1.1 CH-47D Chinook Helicopter

1. Shipboard Operations Capability.
   a. No rotor brake (up to 4+ minutes rotor coast down).
   b. No blade fold (aircraft are capable, but required support equipment is not available to units).
   c. Strong rotor downwash (similar to H-53).
   d. Pressure refueling.
   e. UHF.
   f. APU.
2. Mission.

The aircraft is a heavy assault helicopter used to transport cargo, troops, and weapons during day, night, visual, and instrument conditions.

3. Mission Equipment.
   a. External cargo hooks: 3 (forward, center, aft).
   b. Optional defensive weapons: M60 7.62 mm machine guns.
   c. Cargo loading winch (hydraulically operated).
   d. Internal rescue hoist (operated through the center hook hatch).
   e. Optional 2,320 gallon Forward Area Refueling Equipment (FARE) package for refueling aircraft.
4. SAR Capability.

The CH-47D has a limited overwater SAR capability. It is equipped with an internal rescue hoist, and may carry rescue devices. A swimmer is not carried.

5. Dimensions (see Figure H-9).
   a. Spread (rotors turning): 98'11”L / 60'W / 18'11”H.
   b. Folded (5 blades folded, 1 fwd): 73'6”L / 15'11”W / 18'8”H.
   c. Folded (6 blades folded): 50'9”L / 15'11”W / 18'8”H.
   d. Spot factor (LHA/LHD): 12.5 (spread); 1.73 (5 blades folded, 1 fwd); 1.20 (6 blades folded).
6. Weight.
   a. Empty (no fuel, no crew): 24,000-26,000 lbs.
   b. Operating (internal fuel, crew, no cargo): 32,000 lbs.
   c. Max Gross on deck: 50,000 lbs.
7. Fuel/Quantity.
   a. Primary fuel: JP-8.
   b. Alternate fuel: JP-5/JP-4.
   c. Max internal: 1,028 gals/7,000 lbs.
   d. Max auxiliary internal: up to 2,400 gals/16,300 lbs.
   e. Max total: 3,428 gals/23,300 lbs.
8. Ordnance.
   a. Forward right cabin door: M60 7.62 mm machine gun.
   b. Forward left window: M60 7.62 mm machine gun.
   c. Rear ramp: provisions for a M60 7.62 mm machine gun (typically not used).
   d. Chaff/flares.
   e. CADs for engine fire extinguishers, cargo hook, rescue hoist cable cutter, chaff/flare dispensers.
9. Internal Lift Capability.
   a. Cargo area: 30'6”L (23'4”L w/guns) / 7'6”W / 6'6”H.
   b. Troop capacity: 33 troops (in seats).
   c. Litter capacity: 24 litters.
   d. Pallets: 3 USAF 463L (88” x 108”); 6 HCU-12/E or HCU-10/C pallets (54” x 88”); 8 to 10 warehouse wooden pallets (40” x 48”).
   e. Cargo weight: 18,000 lbs. (approximate).
10. External Lift Capability.
    The CH-47D has 3 cargo hooks. Each hook may be used separately or the forward and aft hook can be used in tandem. Tandem rigged loads will facilitate greater load stability and ensure faster airspeeds during flight.
    a. Forward hook: 17,000 lbs.
    b. Center hook: 26,000 lbs.
    c. Aft hook: 17,000 lbs.
    d. Fwd and aft hook in tandem: 25,000 lbs.

**Note**

Figures are maximum hook rated loads and may not accurately reflect the true capability of the aircraft due to environmental conditions.

11. Comm/Nav Equipment.

a. UHF.

b. VHF (AM/FM).

c. HF.

d. Have Quick/Have Quick II.

e. SINCGARS.

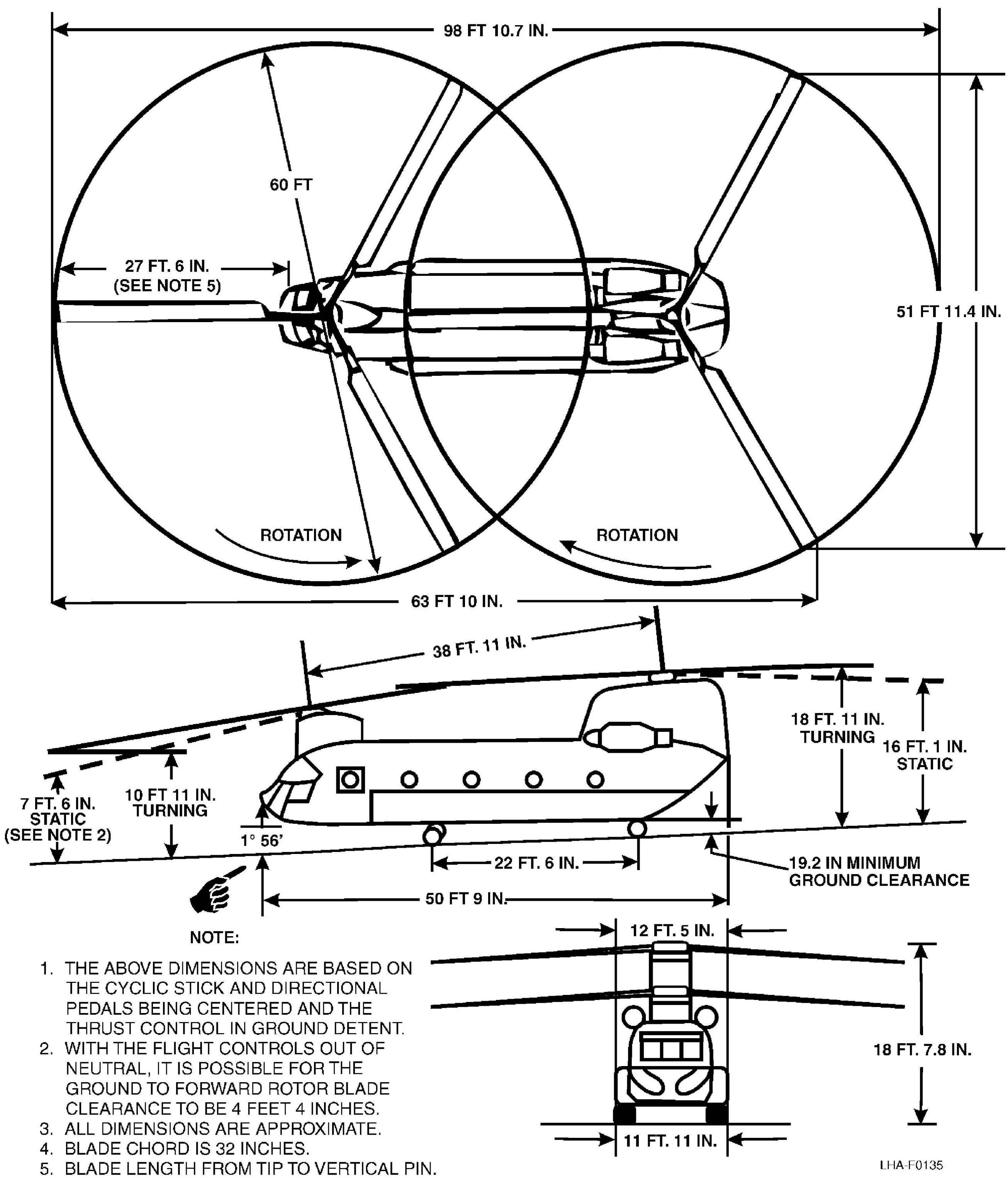
f. GPS.

g. VOR/ILS.

h. ADF.

i. VHF-FM Homing.

Figure H-9. CH−47D Dimensions



### H.3.1.2 MH-47D Assault Helicopter

1. Shipboard Operations Capability.
   a. No rotor brake (up to 4+ minutes rotor coast down).
   b. Manual blade fold (30 minutes under optimum conditions).
   c. Strong rotor downwash (similar to H-53).
   d. Pressure refueling.
   e. TACAN.
   f. UHF.
   g. APU.
2. Mission.

The MH-47D is a heavy assault helicopter used to insert special operations forces, cargo and equipment into hostile landing zones during day, night and adverse weather conditions over long distances.

3. Mission Equipment.
   a. Aerial refueling probe (semi-permanent; not all equipped).
   b. Extensive avionics and navigation equipment.
   c. Weather avoidance/search radar.
   d. Forward Looking Infrared (FLIR).
   e. External cargo hooks: 3 (forward, center, aft).
   f. Optional defensive weapons: 7.62 mm miniguns or M60 machine guns.
   g. Cargo loading winch (hydraulically operated).
   h. Internal rescue hoist (operated through the center hook hatch).
   i. Fast Rope Insertion/Extraction System (FRIES).
   j. Optional 2,320 gallon Forward Area Refueling Equipment (FARE) package for refueling aircraft.
4. SAR Capability.

The MH-47D has a limited overwater SAR capability. It is equipped with an internal rescue hoist, and may carry rescue devices. A swimmer is not carried.

5. Dimensions (see Figure H-10).
   a. Spread (rotors turning): 98’10.7”L / 60’W / 18’11”H.
   b. Folded (5 blades folded, 1 fwd): 73’6”L / 15’11”W / 18’8”H.
   c. Folded (6 blades folded, w/probe): 68’1”L / 15’11”W / 18’8”H.
   d. Folded (6 blades folded, no probe): 51’9”L / 15’11”W / 18’8”H.
   e. Spot factor (LHA/LHD): 12.50 (spread); 1.78 (5 blade fold, 1 fwd); 1.60 (6 blade fold, probe); 1.20 (6 blade fold, no probe).
6. Weight.
   a. Empty (no fuel, no crew): 29,000 lbs.
   b. Operating (internal fuel, crew, no cargo): 42,500 lbs.
   c. Max gross on deck: 50,000 lbs (waiver to 54K lbs).
7. Fuel/Quantity.
   a. Primary fuel: JP-8.
   b. Alternate fuel: JP-5/JP-4.

c. Max internal: 1,028 gals/7,000 lbs.
d. Max auxiliary internal: up to 2,400 gals/16,300 lbs.
e. Max total: 3,428 gals/23,300 lbs.

8. Ordnance.

   a. Forward right cabin door: M134 7.62 mm minigun or M60 7.62 mm machine gun.

   b. Forward left window: M134 7.62 mm minigun or M60 7.62 mm machine gun.

   c. Rear ramp: M60 7.62 mm machine gun.

   d. May mount additional weapons at rear windows as required.

   e. Chaff/flares.

   f. CADs for engine fire extinguishers, cargo hook, rescue hoist cable cutter, chaff/flare dispensers.

9. Internal Lift Capability.

   a. Cargo area: 30'6”L (23'4”L w/guns) / 7'6”W / 6'6”H.

   b. Troop capacity: 33 troops (in seats).

   c. Litter capacity: 24 litters.

   d. Pallets: 3 USAF 463L (88” x 108”); 6 HCU-12/E or HCU-10/C pallets (54” x 88”); 8 to 10 warehouse wooden pallets (40” x 48”).

   e. Cargo weight: 20,000 lbs. (approximate).

10. External Lift Capability.
    The MH-47D has 3 cargo hooks. Each hook may be used separately, or the forward and aft hook may be used in tandem. Tandem rigged loads will facilitate greater load stability and ensure faster airspeeds during flight.

    a. Forward hook: 17,000 lbs.

    b. Center hook: 26,000 lbs.

    c. Aft hook: 17,000 lbs.

    d. Fwd and aft hook in tandem: 25,000 lbs.

**Note**

Figures are maximum hook rated loads and may not accurately reflect the true capability of the aircraft due to environmental conditions.

11. Comm/Nav Equipment.
    a. SATCOM.
    b. UHF.
    c. VHF (AM/FM).
    d. HF.
    e. Have Quick/Have Quick II
    f. SINCGARS.
    g. TACAN.
    h. GPS/INS.
    i. VOR/ILS.
    j. ADF.
    k. Personnel Locator System.

Figure H-10. MH-47HD Dimensions

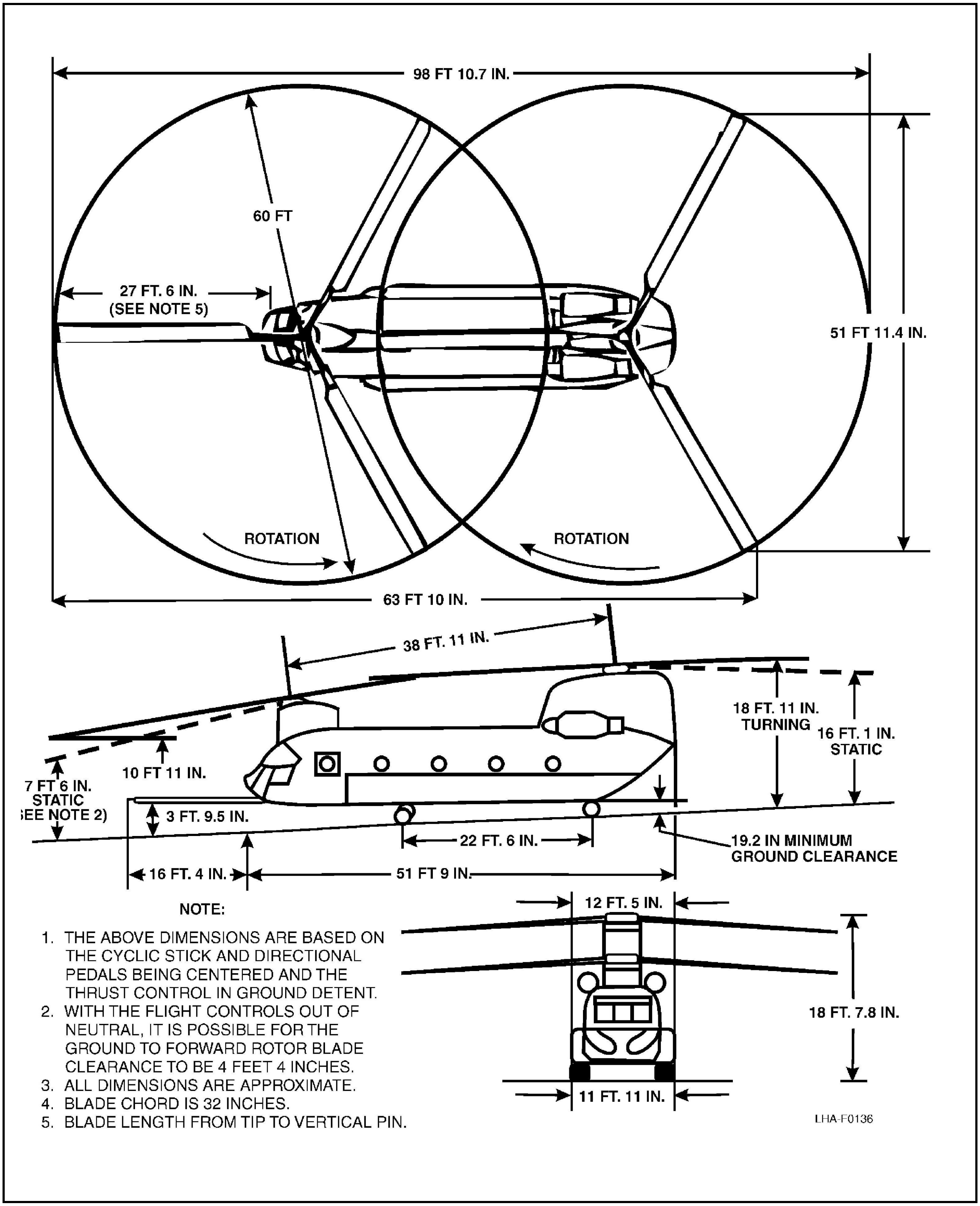
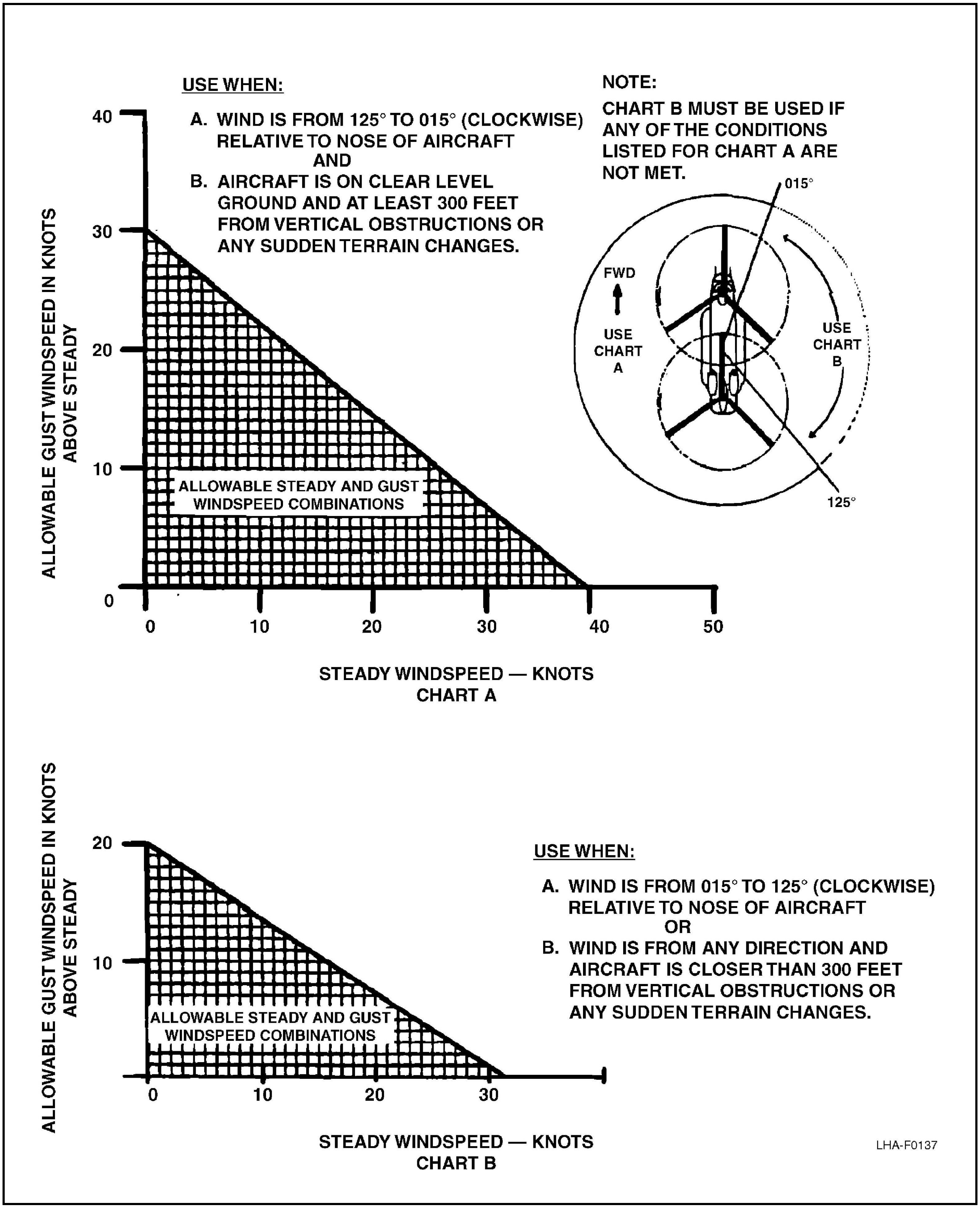


Figure H-11. CH-47D/MH-47D Rotor Engagement Envelopes



### H.3.1.3 MH-47E Assault Helicopter

1. Shipboard Operations Capability.
   a. Rotor brake.
   b. Manual blade fold (30 minutes under optimum conditions).
   c. Axle tiedown rings (outboard of each landing gear wheels).
   d. Strong rotor downwash (similar to H-53).
   e. Pressure refueling.
   f. TACAN.
   g. UHF.
   h. APU.

2. Mission.

The MH-47E is a heavy assault helicopter used to insert special operations forces, cargo and equipment into hostile landing zones during day, night and adverse weather conditions over long distances.

3. Mission Equipment.

   a. Aerial refueling probe (semi-permanent).

   b. Extensive avionics and navigation equipment:
      (1) Multi-mode radar.
      (2) Forward Looking Infrared (FLIR).
      (3) SABRE radio ground communications.

   c. External cargo hooks: 3 (forward, center, aft).

   d. Optional defensive weapons: 7.62 mm miniguns or M60 machine gun.

   e. Cargo loading winch (hydraulically operated).

   f. Internal rescue hoist (operated through the center hook hatch).

   g. Optional external rescue hoist.

   h. Fast Rope Insertion/Extraction System (FRIES).

   i. Optional 2,320 gallon Forward Area Refueling Equipment (FARE) package for refueling aircraft.

4. SAR Capability.

The MH-47E has a limited overwater SAR capability. It is equipped with an internal rescue hoist, and may carry rescue devices. A swimmer is not carried.

5. Dimensions (see Figure H-12).

   a. Spread (rotors turning): 99'L / 60'W / 18'11”H.

   b. Folded (5 blades folded, 1 fwd): 73'10”L / 15'11”W / 18'8”H.

   c. Folded (6 blades folded, w/probe): 68'9”L / 15'11”W / 18'8”H.

   d. Spot factor (LHA/LHD): 12.50 (spread); 2.07 (5 blade fold, 1 fwd); 1.87 (6 blade fold, probe).

6. Weight.
   a. Empty (no fuel, no crew): 29,000 lbs.
   b. Operating (internal fuel, crew, no cargo): 42,500 lbs.
   c. Max gross on deck: 54,000 lbs.

7. Fuel/Quantity.

   a. Primary fuel: JP-8.

   b. Alternate fuel: JP-5/JP-4.
   c. Max internal: 2,068 gals/14,000 lbs.
   d. Max auxiliary internal: up to 2,475 gals/16,800 lbs.
   e. Max total: 4,543 gals/30,800 lbs.

8. Ordnance.
   a. Forward right cabin door: M134 7.62 mm minigun or M60 7.62 mm machine gun.
   b. Forward left window: M134 7.62 mm minigun or M60 7.62 mm machine gun.
   c. Rear ramp: M60 7.62 mm machine gun.
   d. May mount additional weapons at rear windows as required.
   e. Chaff/flares.
   f. CADs for engine fire extinguishers, cargo hook, rescue hoist cable cutter, chaff/flare dispensers.

9. Internal Lift Capability.
   a. Cargo area: 30'6”L (23'4”L w/guns) / 7'6”W / 6'6”H.
   b. Troop capacity: 44 troops (in seats).
   c. Litter capacity: 24 litters.
   d. Pallets: 3 USAF 463L (88” x 108”); 6 HCU-12/E or HCU-10/C pallets (54” x 88”);8 to 10 warehouse wooden pallets (40” x 48”).
   e. Cargo weight: 20,000 lbs. (approximate).

10. External Lift Capability.
    The MH-47E has 3 cargo hooks, each hook may be used separately or the forward and aft hook can be used in tandem. Tandem rigged loads will facilitate greater load stability and ensure faster airspeeds during flight.
    a. Forward hook: 17,000 lbs.
    b. Center hook: 26,000 lbs.
    c. Aft hook: 17,000 lbs.
    d. Fwd and aft hook in tandem: 25,000 lbs.

**Note**

Figures are maximum hook rated loads and may not accurately reflect the true capability of the aircraft due to environmental conditions.

11. Comm/Nav Equipment.

    a. SATCOM.

    b. UHF.

    c. VHF (AM/FM).

    d. HF.

    e. Have Quick/Have Quick II.

    f. SINCGARS.

    g. TACAN.

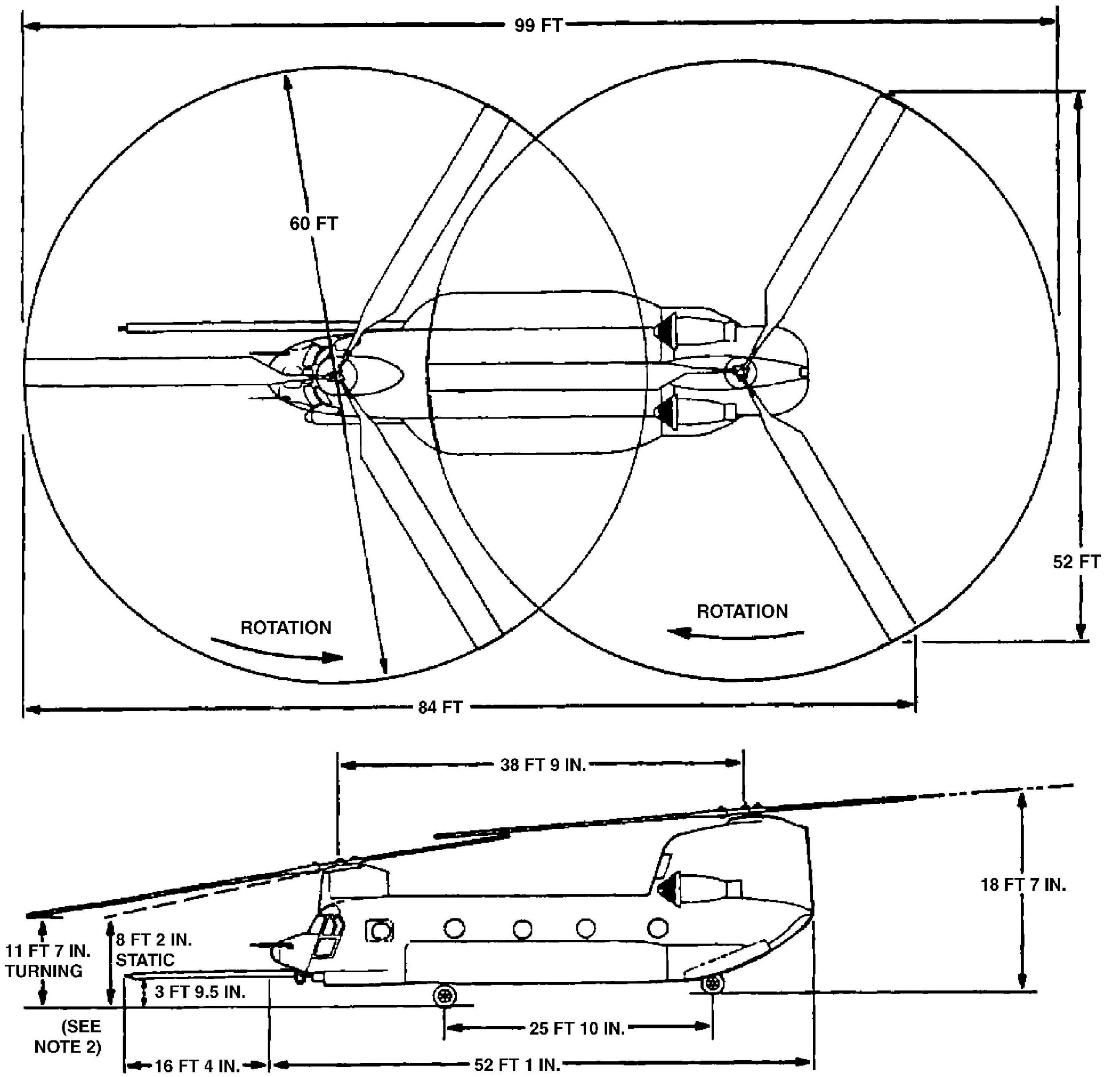
    h. GPS/INS.

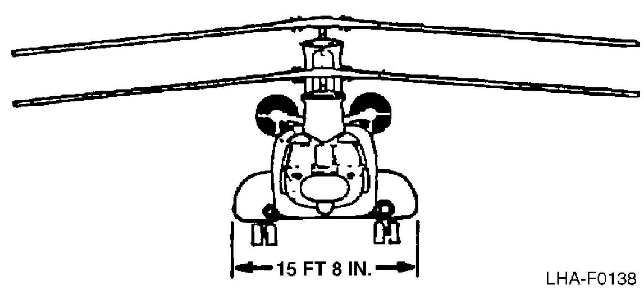
    i. VOR/ILS.

    j. ADF.

    k. Personnel Locator System.

Figure H-12. MH−47E Dimensions




NOTES:

1. THE ABOVE DIMENSIONS ARE BASED ON THE CYCLIC STICK AND YAW PEDALS CENTERED AND THE THRUST CONTROL AT THE DETENT.
2. WITH THE FLIGHT CONTROLS OUT OF NEUTRAL IT IS POSSIBLE FOR STATIC GROUND-TO-FORWARD-ROTOR-BLADE CLEARANCE TO BE 4 FEET 4 INCHES.

Figure H-13. MH−47E Rotor Engagement Envelopes

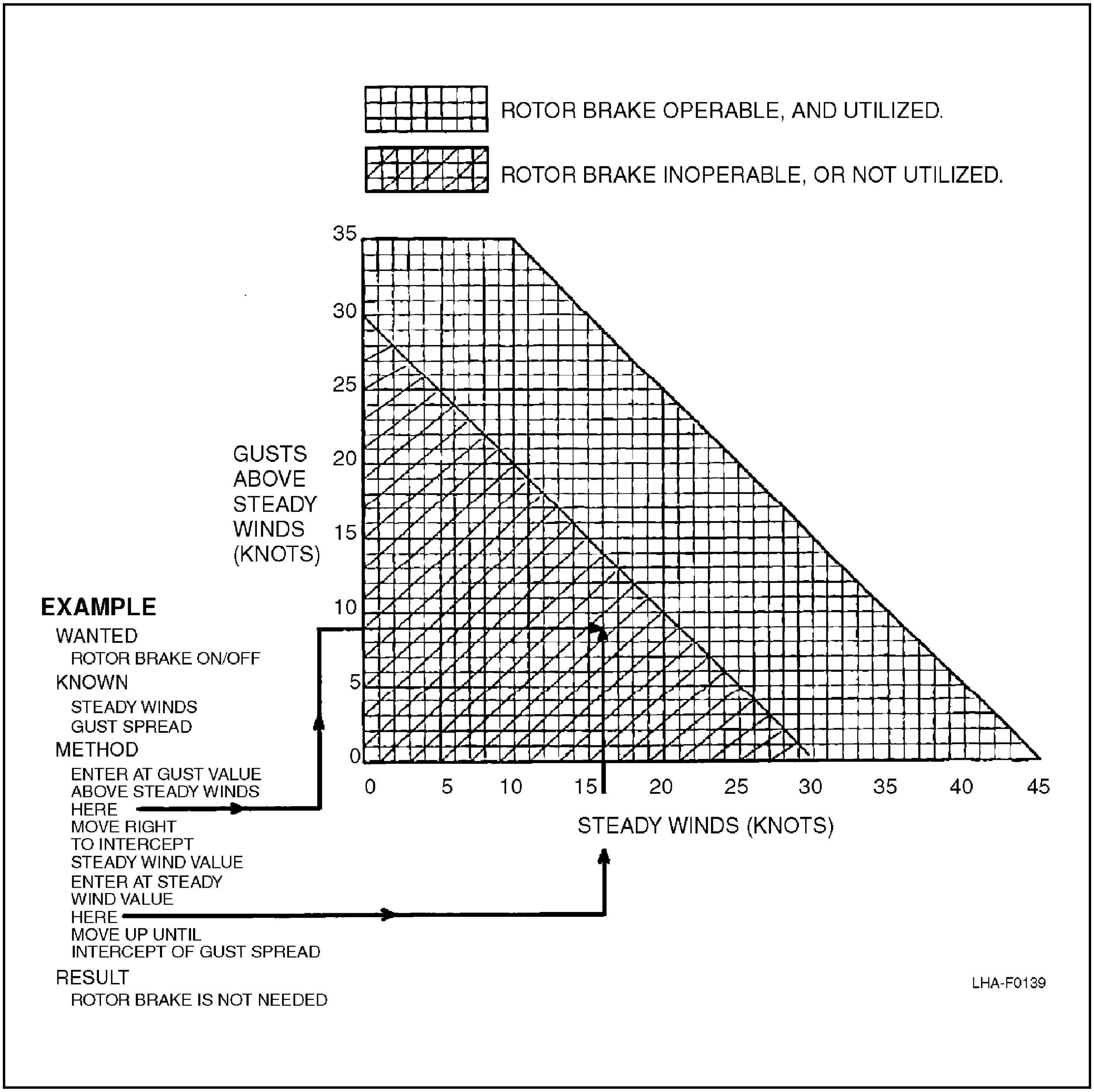
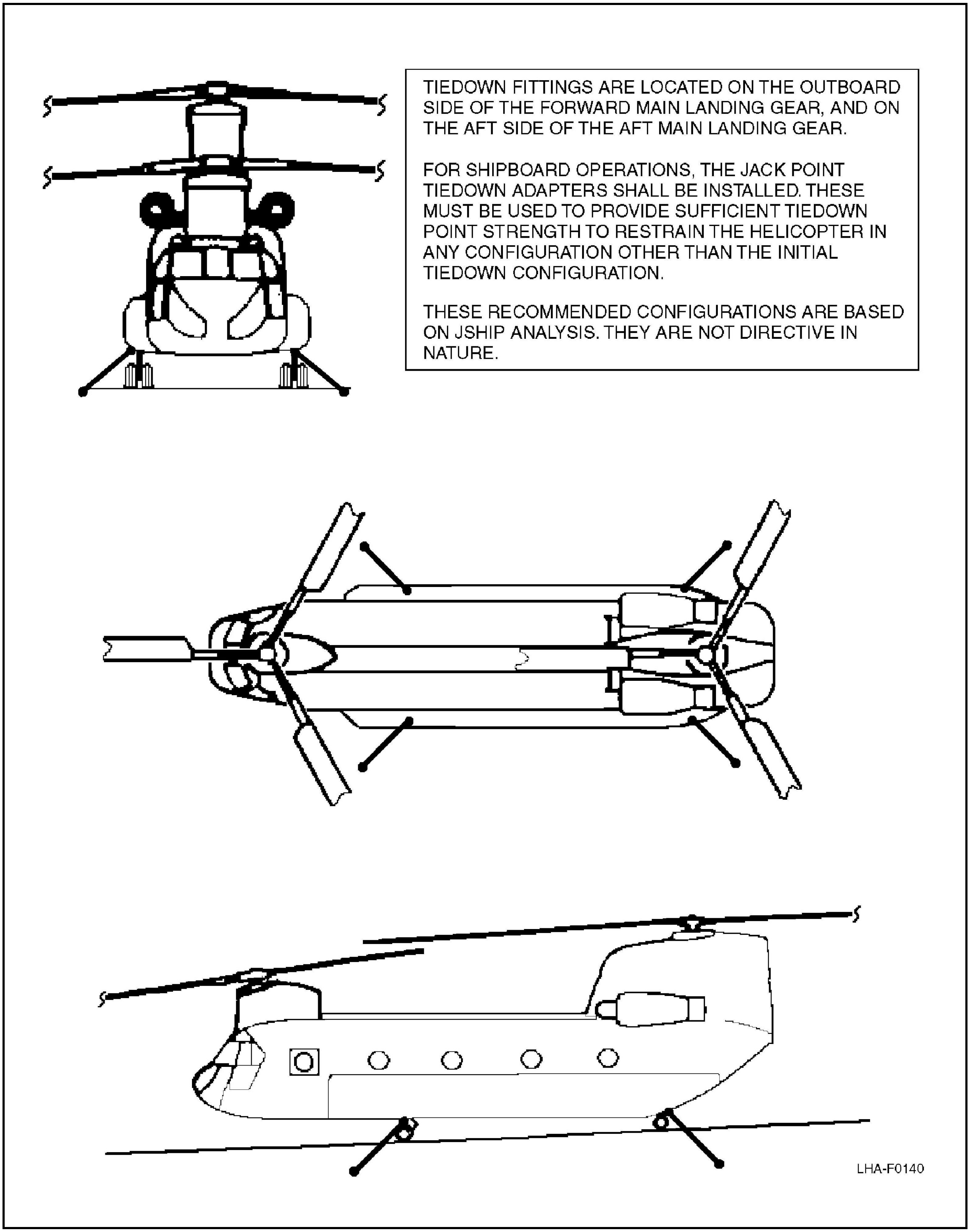


Figure H-14. CH−47D/MH−47D/MH−47E Initial Tiedown Configurations (Recommended)



## H.3.2 H-47 Operational Considerations

### H.3.2.1 Navigation to Ship

Conventional Army CH-47D helicopters are not equipped with TACAN and may require escort and/or radar vectors to navigate to the ship. MH-47D/E helicopters, operated by Army Special Operations Forces, are equipped with TACAN.

### H.3.2.2 ADF Steering to Ship

All CH-47D and MH-47D/E helicopters are capable of receiving HF transmissions and using them for ADF steering to the ship. The ship's HF transmitter must be set for continuous-wave transmission of a single frequency signal between 2,000 to 2,199 kHz at a power level of approximately 50 watts. Ships should coordinate with units to provide a HF signal that will aid in navigation to the ship.

### H.3.2.3 Rotor Downwash

**CAUTION**

CH/MH-47D/E helicopters create strong downwash during hover, similar in magnitude to the H-53 helicopter.

### H.3.2.4 Blade Flapping During Coast Down and Start−Up (H−47D Only)

**WARNING**

CH/MH−47D helicopters are not equipped with rotor brakes; rotor blades begin turning upon engine startup. Recorded rotor coast down times approach 4 minutes in winds as light as 20 knots. Changing wind conditions, gusts, flight deck turbulence and rotor downwash from other helicopters can create excessive blade flapping and cause aircraft damage. Relative crosswinds that create strong updrafts at the ship's deck edge should be avoided. Extreme caution should be exercised when starting or shutting down these helicopters on board ship. The ship should treat start and shutdown of CH/MH−47D helicopters as if they had a rotor brake failure and be ready to provide optimum winds for the start or windmilling stop of the rotor system.

### H.3.2.5 Static Blade Flapping and Tiedown

**CAUTION**

Unlike Navy helicopters, Army H−47 helicopters are not equipped with an anti−flap device to limit excessive upward flapping of static main rotor blades. These helicopters are susceptible to static blade flapping, especially if blades are unrestrained and over the water in relative crosswinds that create strong updrafts at the ship's deck edge.

**Note**

Unlike Navy helicopters, H−47 rotor blades cannot be folded quickly and should be tied down immediately after shutdown. Tiedown of H−47 blades requires pins to be inserted near the blade tips. If blades are hanging over the deck edge, tiedown will be more difficult and time−consuming, requiring rotation of the blades. In high winds, securing blades by rope to the fuselage may not provide adequate prevention of flapping. Units may choose to secure the blades to the flight deck padeyes, which may require respotting. Ships should provide optimum wind conditions during shut down of CH/MH−47D/E helicopters until the blades are tied down.

### H.3.2.6 Tiedown Fittings

H−47 aircraft have four towing shackles, located near each main landing gear, which are used for chaining. Additionally, the helicopters have provisions for two removable aft jack point tiedown adapters, which are rings attached by a bolt to the jack pad area located on the lower side of each sponson, just forward of each rear landing gear. Analysis indicates that without use of the jack point tiedown adapters, there will be insufficient lateral strength in the towing shackles to properly restrain the aircraft during moderate or heavy weather, regardless of the number of chains applied. This finding highlights the need to configure H−47 helicopters with jack point tiedown adapters when embarking operationally aboard ship, and is consistent with the Army requirement to use jack point tiedown adapters when transporting the aircraft by vessel, truck or air.

### H.3.2.7 Handling

**CAUTION**

When moving CH/MH−47D/E helicopters, a manually operated steering bar must be attached to the castering left rear wheel to keep it parallel to the right rear wheel. The left rear wheel must be kept parallel to the right rear wheel to prevent damage. Deck personnel should be trained in the proper use of the CH/MH−47D/E manually operated steering bar.

**Note**

Operation of the manual steering bar is cumbersome, requiring attention and coordination with the tractor/towbar when going backwards and reversing directions, especially when maneuvering in close quarters. Some units possess unique tandem towbars that connect the towbar and the steering bar to eliminate the need to hand−tend the second wheel. This system provides benefits when going backwards and reversing directions frequently, but does not allow for as much steering throw travel as the single bar system, and may not be preferable in all situations. Ships handling crews should expect difficulties when handling CH/MH−47D/E helicopters in close quarters aboard ship.

### H.3.2.8 Compatibility with SD−2 Spotting Dolly

The SD−2 spotting dolly may be used to maneuver CH/MH−47D/E helicopters. The aircraft's right rear tailwheel must be raised or lowered while aligned with the longitudinal axis of the aircraft. While the tail wheel is raised, the SD−2 can operate from 30° left and 90° right of the longitudinal axis.

### H.3.2.9 Locally−Procured Blade Fold System

Army Special Operations Force (SOF) units have developed a limited number of manual blade fold kits that can be used on CH or MH−47D/E helicopters. CH−47 units typically do not possess blade fold equipment, but may in a contingency. To fold or spread requires 12 people. The aircraft must be spotted with rotor arc over the deck and APU running. After disconnecting hardware at the rotor head and installing servo blocks, each blade must be manually supported by four people using a pole and walked around to its folded position in a rack on the fuselage top. Units will require deck winds of less than 30 knots and minimum deck motion during folding or spreading, due to difficulties in controlling the blades. Although all 6 blades can be folded over the fuselage, the preferred method aboard ship is to fold 5 blades and leave one blade extended over the nose of the aircraft. Recorded times for highly experienced crews to fold or spread 5 blades vary from approximately 30 to 35 minutes; inexperienced crews will take significantly longer. The aircraft may or may not require a maintenance check flight afterwards.

#### H.3.2.10 Fit on LHD/LHA-6 Type Elevator

A spread H−47 helicopter will not fit on an LHD Type elevator. One or two H−47 helicopters in the 5 blade fold configuration will fit on a LHD/LHA-6 elevator (total weight must be below 75,000 lbs).

#### H.3.2.11 External Hydraulic Power Connections

H−47 helicopters are equipped with quick−disconnect external hydraulic power fittings that will not fit Navy hydraulic support equipment fittings that are threaded. Adapters to mate H−47 and Navy fittings are not available through normal procurement channels, but can be made by fitting an H-47 female quick disconnect fitting and a Navy male threaded fitting to either end of a length of flexible hydraulic line.

#### H.3.2.12 Cargo Loading/Off-Loading

Clearance under the H−47 tail section is restricted. When loading and off-loading cargo, clearance is further reduced by landing gear strut compression as the aircraft's gross weight increases. 6,000 pound capacity forklifts may not fit under the tail at high aircraft gross weights. Fork extenders may be required when loading/off-loading 463L pallets. Pallet loads may need to be restricted to accommodate the capacity of compatible shipboard forklifts. H−47 aircraft with the Helicopter Internal Cargo Handling System can be configured with ramp extenders with rollers that effectively increase the clearance under the tail and enable the use of larger forklifts and heavier pallets.

#### H.3.2.13 Electromagnetic Vulnerability

**CAUTION**

Various shipboard transmitters can adversely affect non-Navy helicopters. When conducting joint shipboard helicopter operations, consideration must be given to potential radiation hazards, electromagnetic interference, and electronic vulnerability effects so that applicable transmitter conditions can be set prior to the non−Navy helicopter(s) arrival aboard the ship.

## H.4 AH-64A/D SERIES HELICOPTERS

### H.4.1 Basic Capabilities and Characteristics

The Army AH-64 Apache attack helicopter has a two−place tandem cockpit, 4−bladed main and tail rotors, 2 T700-GE-701/701C series engines with APU, non−retractable landing gear with 2 main wheels and swiveling tailwheel, and wings to mount 4 stores pylons.

1. Crew.

Crews consist of 1 pilot and 1 copilot/gunner (CPG).

2. Shipboard Operations Capability.
   a. Rotor brake.
   b. No blade fold ability (blades must be removed).
   c. Pressure refueling (except external tanks).
   d. No TACAN.

e. UHF.

f. APU.

3. Mission.

The AH-64A series is the basic Apache attack helicopter utilized as an aerial weapons platform. The AH-64D is a remanufactured and upgraded version of the AH-64A and has improvements to the airframe which include increased electrical power, integrated information processing, improved cooling, expanded forward avionics bays, and a manpower and integration (MANPRINT) cockpit to improve crew performance. The “D” series can be configured with a mast mounted Longbow Fire Control Radar.

4. Mission Equipment.

a. Turret-mounted Target Acquisition Designator Sight (TADS) and Pilot Night Vision Sensor (PNVS).

b. Turret mounted 30 mm chain gun.

c. Four wing-mounted stores pylons for ordnance or Extended Range Fuel System (ERFS) tanks.

5. SAR Capability.

None. Optical sights and night vision systems offer limited search capabilities.

6. Dimensions (see Figures H-15 and H-16).

a. Spread (rotors turning): 57'8”L / 48'W / 15'3”H (18'7”H with fire control radar on main rotor mast or AM/FM antenna on tail pylon).

b. Main rotors removed: 49'1”L / 17'2”W (AH-64A); 16'4”W (AH-64D) / 15'3”H.

c. Spot factor (LHA/LHD): 4.76 (spread).

7. Weight.

a. Empty (no fuel, no crew): AH-64A: 11,000 lbs; AH-64D: 12,700 lbs.

b. Operating (internal fuel, crew): AH-64A: 15,500 lbs; AH-64D: 16,900 lbs.

c. Max gross on deck: AH-64A: 21,000 lbs; AH-64D: 23,000 lbs.

8. Fuel/Quantity.

a. Primary fuel: JP-8.

b. Alternate fuel: JP-5/JP-4.

c. Max internal: 376 gals/2,560 lbs.

d. Typical mission external: 230 gals/1,560 lbs.

e. Max external: 920 gals/6,260 lbs.

f. (4 x 230 gal tanks — ferry only.)

g. Max total: 1,296 gals/8,820 lbs.

9. Ordnance.

a. 30 mm turret-mounted chain gun.

b. 2.75” rockets.

c. HELLFIRE missiles.

d. RF HELLFIRE missiles (AH-64D only).

e. Chaff/flares.

f. CADs for engine fire extinguishers, external stores jettison, chaff/flare dispensers.

10. Internal Lift Capability.

None.

11. External Lift Capability.

None.

12. Comm/Nav Equipment.

    a. UHF.

    b. VHF (AM/FM).

    c. Have Quick/Have Quick II.

    d. SINCGARS.

    e. Embedded GPS-INS (EGI).

    f. ADF.

Figure H-15. AH-64A Dimensions

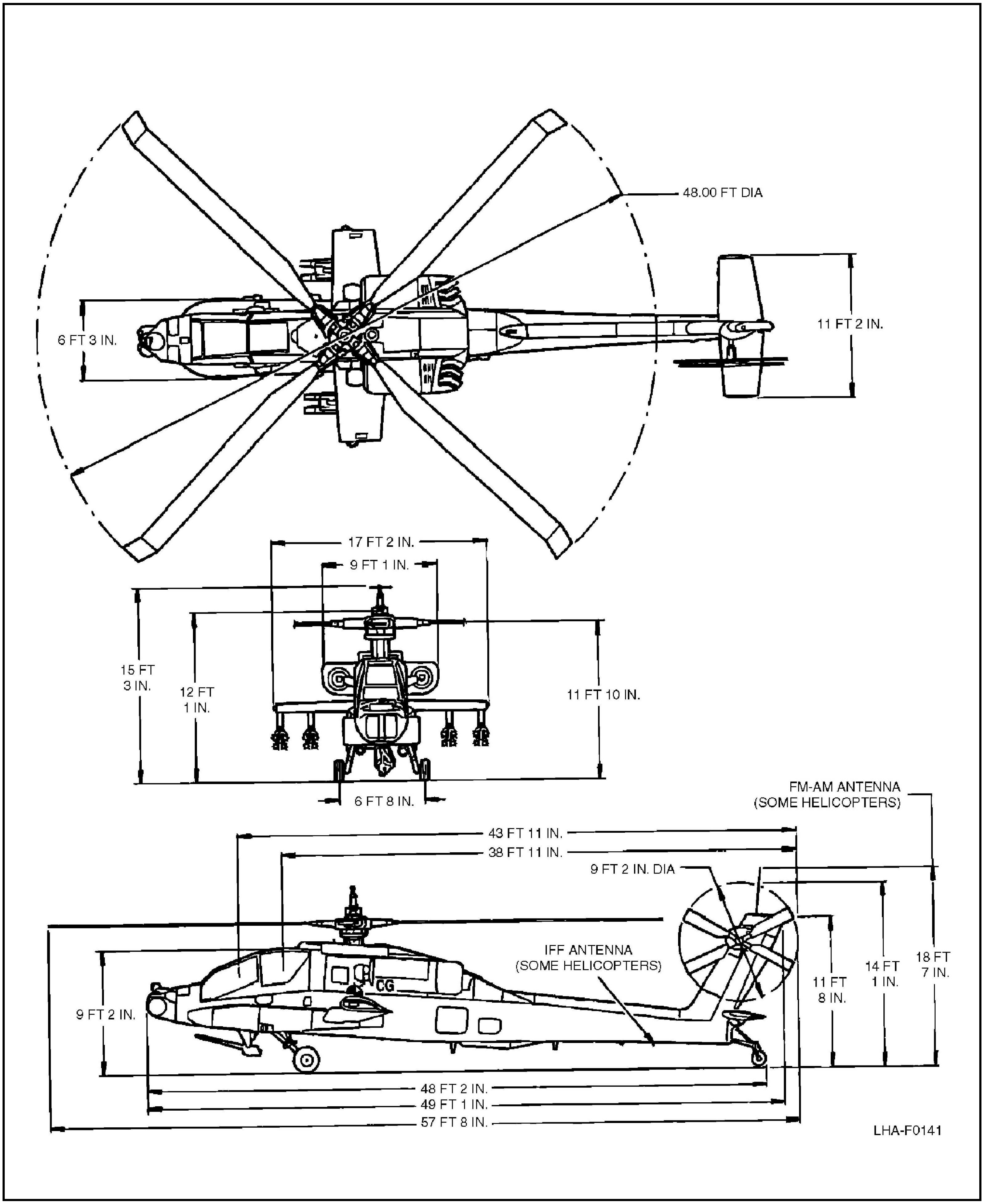


Figure H-16. AH-64D Dimensions

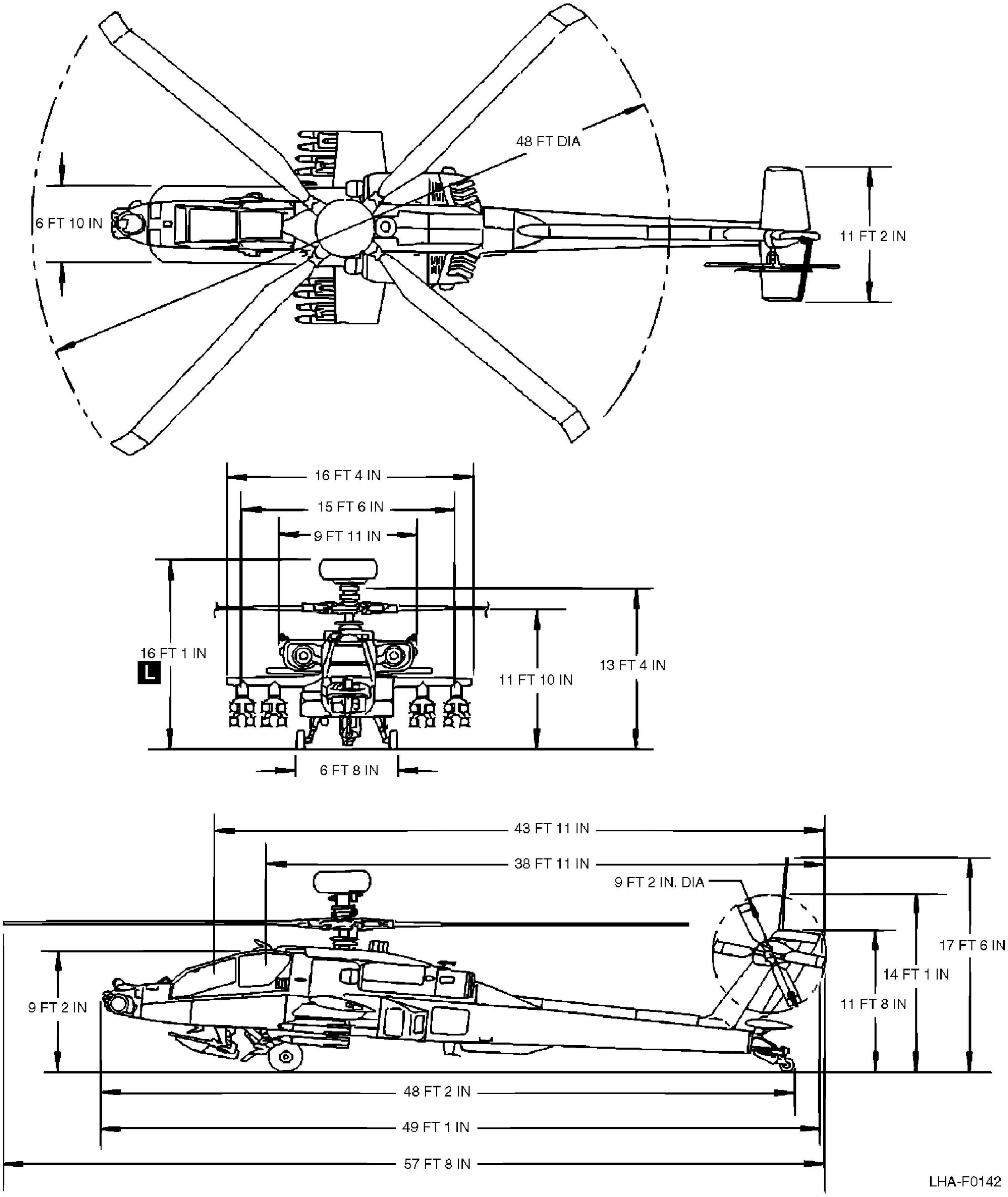
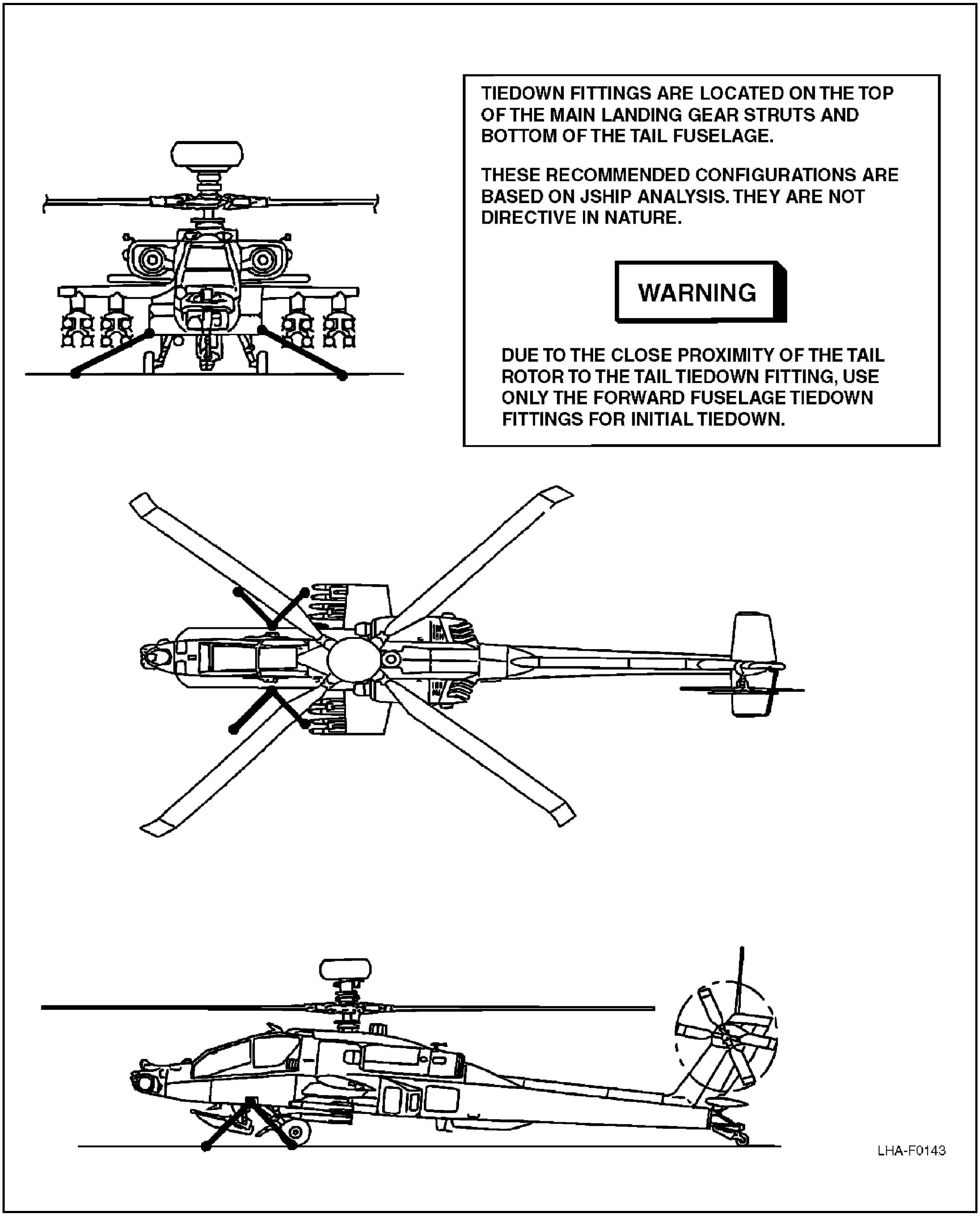


Figure H-17. AH-64A/D Initial Tiedown Configuration (Recommended)



### H.4.2 AH-64 Operational Considerations

#### H.4.2.1 Navigation to Ship

AH-64A/D helicopters are not equipped with TACAN and may require escort and/or radar vectors to navigate to the ship.

#### H.4.2.2 ADF Steering to Ship

AH-64 helicopters are capable of receiving HF transmissions and using them for ADF steering to the ship. The ship's HF transmitter must be set for continuous-wave transmission of a single frequency signal between 2,000 to 2,199 kHz at a power level of approximately 50 watts. Ships should coordinate with units to provide a HF signal that will aid in navigation to the ship.

#### H.4.2.3 Tiedown Fittings

The AH-64A/D permanent forward tiedown points consist of an integral lug located high on each landing gear strut, recessed behind an access panel. A removable forward fuselage tiedown fitting can be mounted on each landing gear cross tube immediately forward of the permanent lug. The removable fittings extend outboard beyond the side of the aircraft and allow for unrestricted access for chaining. The forward fuselage tiedown fittings are superior in strength to the permanent lugs in all directions. Use of the removable forward fuselage tiedown fitting provides adequate strength to restrain the AH-64A/D in all directions at all gross weights and weather conditions. This finding highlights the need to configure AH-64A/D helicopters with removable forward fuselage tiedown fittings when embarking operationally aboard ship.

#### H.4.2.4 Chaining with Rotors Turning

**WARNING**

The AH-64A/D tail rotor is in close proximity to the aft fuselage tiedown fitting. The aft fuselage tiedown fitting should not be used or approached any time the rotor is turning. For initial tiedown configuration (four chains), attach two chains to each forward fuselage tiedown fitting or the mooring lug on each MLG trailing arm, if the forward fuselage tiedown fittings are not installed.

#### H.4.2.5 Chain Removal

The AH-64A/D has a pronounced tendency to roll on its landing gear in response to ship motion. This characteristic may manifest itself in alternately slack and tight forward tiedown chains. Chaining crews should wait until the chain slackens prior to removing the chain.

#### H.4.2.6 Static Blade Flapping and Tiedown

**CAUTION**

Army AH-64A/D helicopters are not equipped with an anti-flap device to limit excessive upward flapping of static main rotor blades. These helicopters are susceptible to static blade flapping, especially if blades are unrestrained and over the water in relative crosswinds that create strong updrafts at the ship's deck edge.

**Note**

Tiedown of AH-64A/D blades requires socks to be placed over the blade tips. If blades are hanging over the deck edge, tiedown will be more difficult and time-consuming, requiring rotation of the blades. Ships should provide optimum wind conditions during shut down of AH-64A/D helicopters until the blades are tied down.

### H.4.2.7 Instability on Deck

**WARNING**

The AH-64A/D is more susceptible to rollover than other Navy and Army helicopters. Ship roll angles of as little as 8° may lead to rollover of an unchained AH-64A/D, resulting in damage to the helicopter and injury to personnel. Asymmetric loading will increase susceptibility. Extreme caution should be exercised when moving or operating the helicopter unchained, especially under unpredictable ship rolling conditions.

### H.4.2.8 Compatibility with SD-2 Spotting Dolly

The SD-2 spotting dolly may be used to maneuver H-64 aircraft. Prior to raising or lowering the helicopter, the tail wheel must be aligned with the aircraft's longitudinal axis. Once the tail wheel is raised approximately 9 inches, the SD-2 can operate up to ±90 degrees from the aircraft's longitudinal axis.

**CAUTION**

When maneuvering AH-64 aircraft with the SD-2, caution must be exercised to ensure that the rotational limits of the SD-2 lifting arms are not exceeded, causing damage to the aircraft or the SD-2.

### H.4.2.9 Refueling Procedures Training

During refueling operations, the fuel handlers must follow the refuel checklist on the inside panel of the refueling panel access door. A crucial step in the refuel process occurs after refueling is complete; the REFUEL VALVE switch must be turned to the CLOSED position, or fuel cannot be transferred between the two fuel cells. An inability to transfer fuel causes a fuel imbalance and can exceed center of gravity limits with possibly catastrophic results. The AH-64A/D crew does not include a crewchief and normally neither pilot assists in refuel operations. Therefore, it is critical that the ship's fuels personnel receive familiarization training on AH-64A/D refueling procedures and external cockpit switchology prior to the aircraft arriving onboard so they are prepared to safely refuel the aircraft.

### H.4.2.10 Pressure Refueling

The recessed fuel panel of the AH-64A/D may cause interference with the older version of the Carter #64349 D-1 single point pressure refueling nozzle. This nozzle must be mounted with the flow control handle at the 8 o'clock position, to allow full travel of the handle.

### H.4.2.11 Refueling of External Tanks

The external fuel tanks on the AH-64A/D can only be gravity refueled.

#### H.4.2.12 Electromagnetic Vulnerability

**WARNING**

Various shipboard transmitters can adversely affect non-Navy helicopters. When conducting joint shipboard helicopter operations, consideration must be given to potential radiation hazards, electromagnetic interference, and electronic vulnerability effects so that applicable transmitter conditions can be set prior to the non-Navy helicopter(s) arrival aboard the ship.

## H.5 OH-58D SERIES HELICOPTERS

### H.5.1 Basic Capabilities and Characteristics

The base Army OH-58D series helicopter has a 4-bladed main rotor and a 2-bladed tail rotor, one T703-AD-700A engine, and fixed landing skids. The aircraft operates in day/night VMC only.

1. Crew.
   a. A crew consists of 1 pilot and 1 copilot/gunner (CPG).
2. Shipboard Operations Capability.
   a. No rotor brake (2 to 8+ minutes rotor coast down).
   b. Single engine (travels over water in pairs).
   c. Manual main rotor blade fold (3 to 5 minutes under optimum conditions).
   d. Manual fold of horizontal stabilizer.
   e. Closed circuit refueling (15 psi - not compatible with HIFR nozzle) or gravity refueling only.
   f. No auxiliary fuel tanks.
   g. Skid landing gear.
   h. Can be configured with Rapid Deployment Landing Gear (improved tiedown points).
   i. No TACAN.
   j. UHF.
   k. No APU (battery start).
   l. Day/night VFR only (NVD-capable).
3. Mission.

The primary mission of the OH-58D series is to conduct close combat aerial reconnaissance, intelligence gathering, surveillance, and target acquisition, and is armed for self-defense and targets of opportunity.

4. Mission Equipment.
   a. Main rotor Mast-Mounted Sight Subsystem (MMSS) containing:
      (1) Television Sensor (TVS).
      (2) Thermal Imaging Sensor (TIS).
      (3) Laser Rangefinder/Designator (LRF/D).
   b. Universal weapons pylons capable of mounting offensive weapons.

5. SAR Capability.

None. Optical sights and night vision systems offer limited search capabilities.

6. Dimensions (see Figures H-18 and H-19).
   a. Spread (rotors turning): 41'2"L / 35'W / 12'11"H.
   b. Folded: 33'7.2"L / 9'2"W / 12'11"H (folded stab).
   c. Spot factor (LHA/LHD): 2.18 (spread); 0.57 (all blades folded).
7. Weight.
   a. Empty (no fuel, no crew): 3,600 lbs.
   b. Operating (internal fuel, crew): 4,700 lbs.
   c. Max Gross on deck: 5,200 lbs.
8. Fuel/Quantity.
   a. Primary fuel: JP-8.
   b. Alternate fuel: JP-5/JP-4.
   c. Max capacity: 110 gals/750 lbs.
9. Ordnance.
   a. .50 cal machine gun.
   b. 2.75" rockets.
   c. Air-to-Air Stinger (ATAS) missiles.
   d. HELLFIRE missiles.
   e. CADs for external stores jettison.
10. Internal Lift Capability.

None.

11. External Lift Capability.

None.

12. Comm/Nav Equipment.
    a. UHF.
    b. VHF (AM/FM).
    c. HF.
    d. Have Quick/Have Quick II.
    e. SINCGARS.
    f. Embedded GPS-INS (EGI).

### H.5.2 OH-58D Operational Considerations

#### H.5.2.1 Navigation to Ship

Most OH-58D helicopters are not equipped with TACAN and may require escort and/or radar vectors to navigate to the ship.

### H.5.2.2 Rotor Coast Down

OH-58D helicopters do not have rotor brakes. Recorded rotor coast down times vary from 2 minutes in 20 knot winds to almost 8 minutes in 30 knot winds.

### H.5.2.3 Aircraft Tiedown Fittings

OH-58D helicopters are configured with one of two types of aircraft tiedown fittings. An aircraft with standard landing gear has three tiedown rings. Each ring is bolted to an aircraft jack point on the underside of the fuselage: one under each pilot's seat, and a third next to the lower anti-collision light (see Figure H-20). An aircraft fitted with the rapid deployment landing gear has four additional tiedown lugs, one integral to the top of each landing gear strut (see Figure H-21). These lugs allow for unrestricted access for chaining and are superior in strength to the jack point tiedown rings in all directions. The jack point rings do not provide adequate strength to restrain the OH-58D in all directions at all gross weights and weather conditions. Aircraft configured with the rapid deployment landing gear are preferred for shipboard operations.

**WARNING**

The OH-58D is a lightweight helicopter and is very susceptible to damage from high winds and rotor wash. Downwash from an adjacent upwind spot has caused jack point tiedown rings to shear/separate from their mounts, allowing the OH-58D to slide toward the deck edge. Launches and recoveries to a spot immediately upwind or crosswind from an OH-58D (blades rotating, static, tied down or folded) should not be conducted except in case of an emergency.

### H.5.2.4 Use of ALBAR/NT-4 Towbars

OH-58D helicopters are configured with tow rings inboard on the landing gear skids. These rings will not mate with the ALBAR or NT-4 towbars configured for wheeled helicopters. It is possible to reconfigure the ALBAR or NT-4 towbar to mate with the OH-58D skid tow rings as follows:

1. Swap the left/right ALBAR/NT-4 foot assemblies.
2. Remove the ALBAR/NT-4 axle tow pins.

This reconfiguration will render the ALBAR/NT-4 towbar incapable of towing Navy wheeled aircraft.

### H.5.2.5 Handling and Parking

**WARNING**

- The OH-58D will slide on its skids on a wet and/or moving deck. Whenever the aircraft is shut down, in addition to chains, ground handling wheels should be attached to the skids and chocks applied to the wheels.
- OH-58D ground handling wheels do not have brakes. The aircraft should not be raised on its handling wheels until immediately prior to aircraft movement. Chains should remain applied until the aircraft is raised on its wheels. Once raised, the aircraft should be treated as a wheeled aircraft without brakes. Braking of the aircraft by lowering it onto the skids cannot be accomplished immediately under all conditions. Chocks should be used on the ground handling wheels to the fullest possible extent during movement evolutions.

### H.5.2.6 Refueling

**WARNING**

Shipboard HIFR (CCR) nozzles, such as the Wiggins and NATO High Capacity (NHC) nozzles, cannot be used to closed circuit refuel OH-58D helicopters. The 45 psi output of these nozzles could cause damage to the aircraft's fuel systems, rupture tanks, and cause a fuel spill or fire.

**Note**

- If shipboard CCR operations are anticipated for OH-58D helicopters, an Army fuel nozzle must be either provided by the aircrews or included as part of the unit's deployment packup equipment.
- When refueling OH-58D aircraft, personnel must visually ensure that the aircraft's fuel receiver latch tool, attached to the fuel cap lanyard, is not lying in the fuel receptacle. The latch tool will prevent proper mating of the nozzle with the receptacle if it is not removed, which will preclude fuel flow.
- Prior to operations with OH-58D aircraft, fuel crews should familiarize themselves with OH-58D closed circuit refueling procedures and equipment.

### H.5.2.7 Defueling

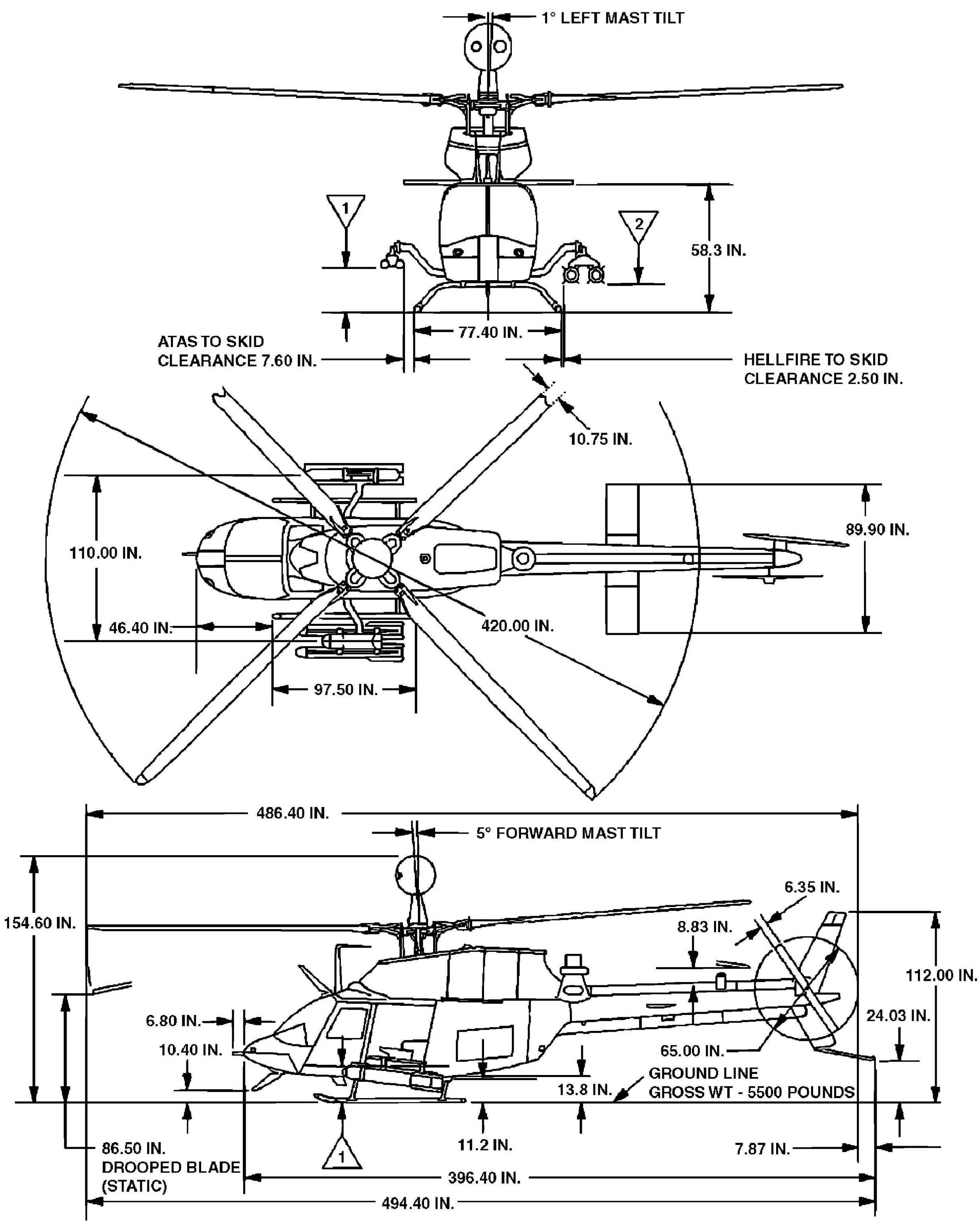
Suction defueling through the aircraft fuel filler port is the preferred method of shipboard defueling OH-58D aircraft. The inner diameter of the fuel filler port is too small to accommodate a section of rigid 1 1/2 inch defuel hose. A defueling adapter with a flexible/collapsible 1 1/2 inch or smaller gauge hose will be required.

### H.5.2.8 Electromagnetic Vulnerability

**WARNING**

Various shipboard transmitters can adversely affect non-Navy helicopters. When conducting joint shipboard helicopter operations, consideration must be given to potential radiation hazards, electromagnetic interference, and electronic vulnerability effects so that applicable transmitter conditions can be set prior to the non-Navy helicopter(s) arrival aboard the ship.

Figure H-18. OH-58D Dimensions — Standard Landing Gear




OH-58D WITH STANDARD LANDING GEAR

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Figure H-19. OH-58D Dimensions — Rapid Deployment Landing Gear

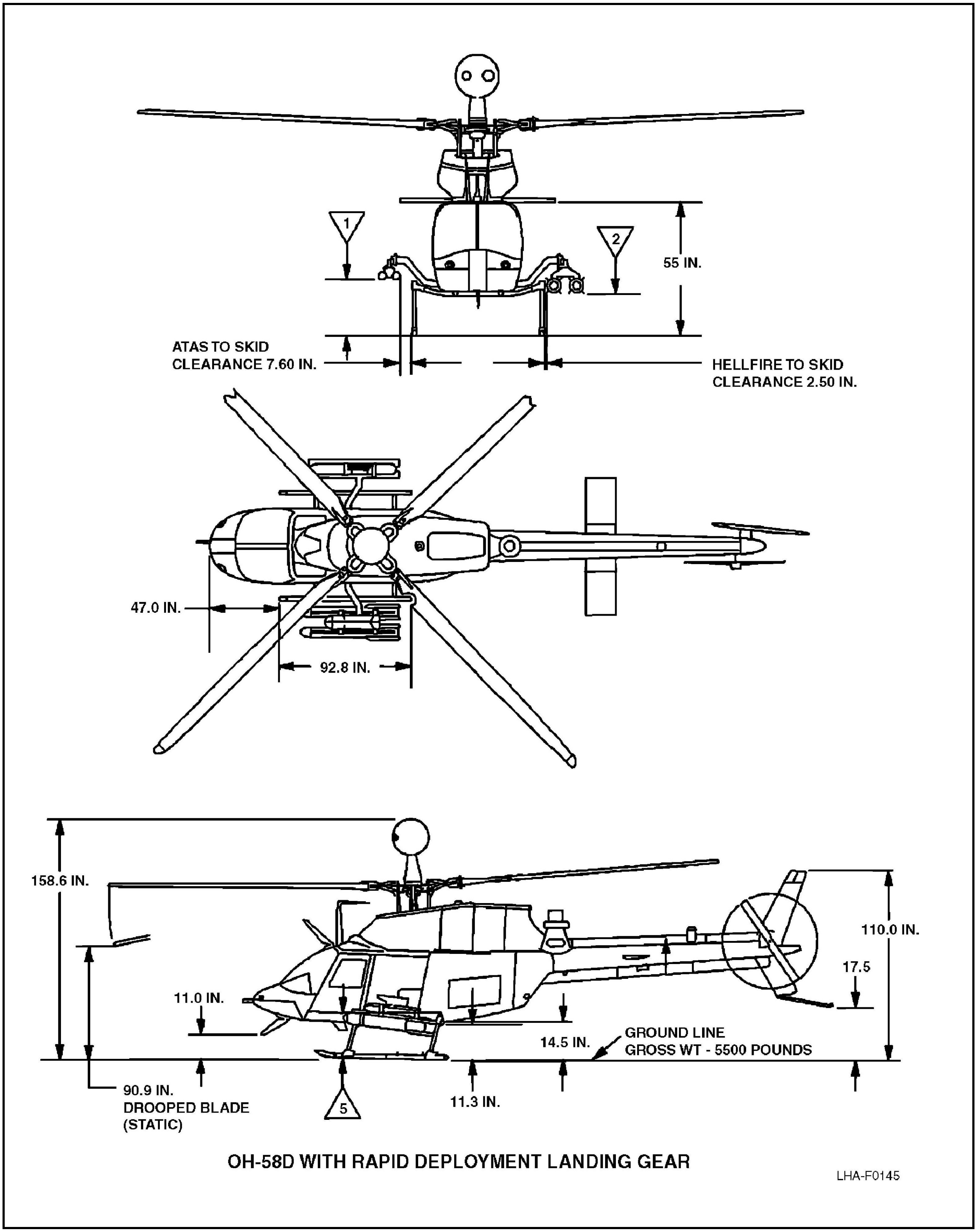


Figure H-20. OH-58D Initial Tiedown Configuration — Standard Landing Gear (Recommended)

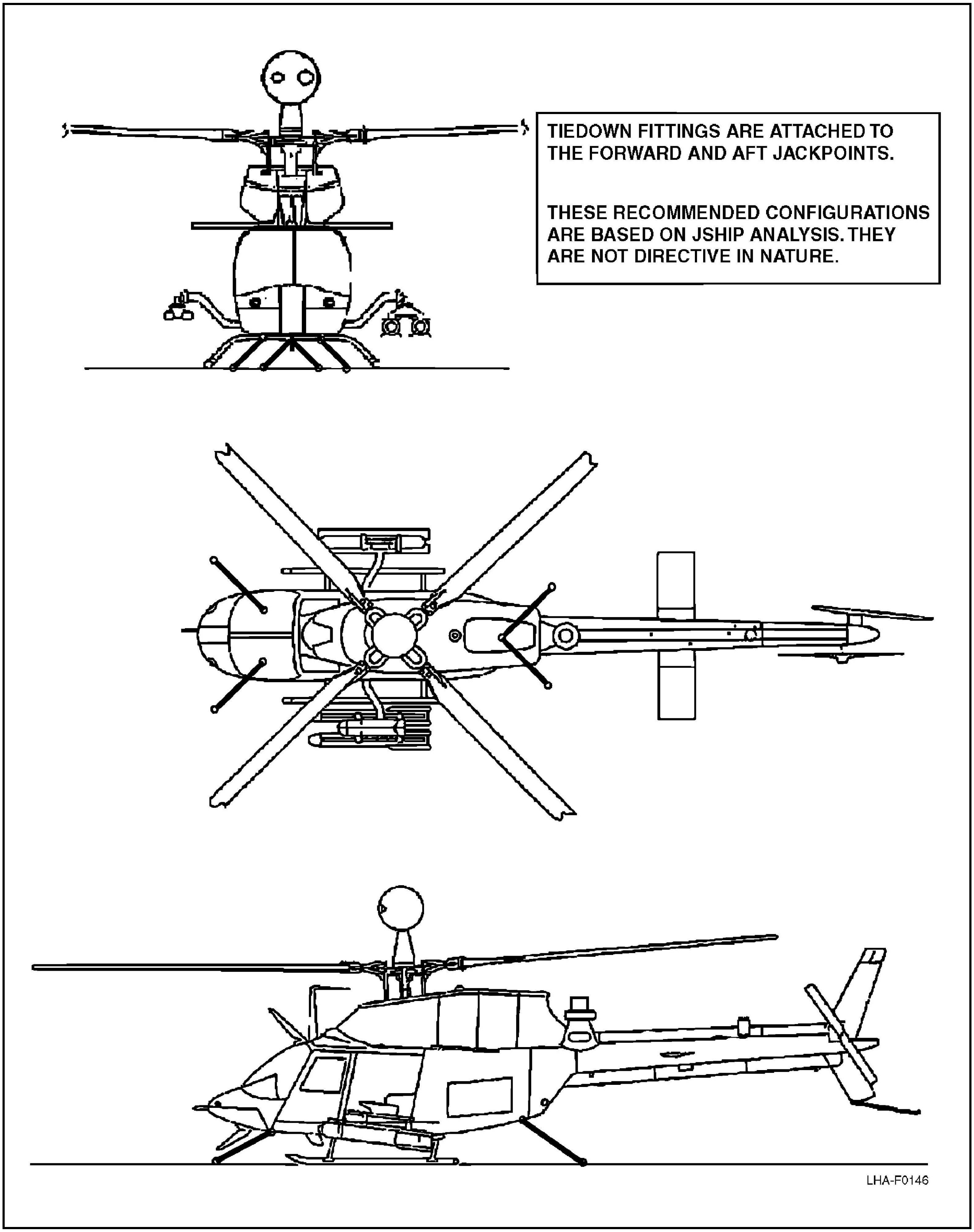
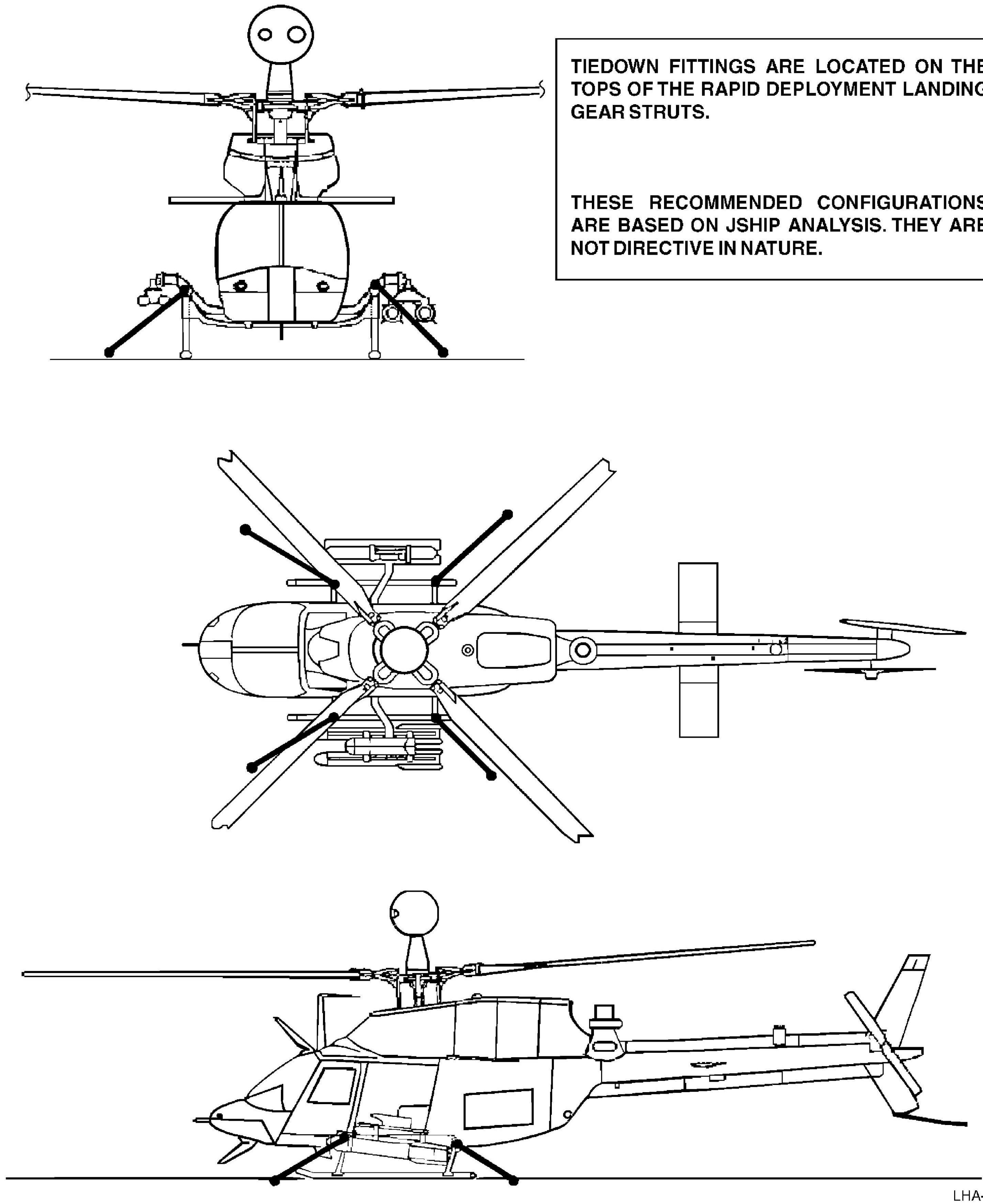


Figure H-21. OH-58D Initial Tiedown Configuration — Rapid Deployment Landing Gear (Recommended)

TIEDOWN FITTINGS ARE LOCATED ON THE TOPS OF THE RAPID DEPLOYMENT LANDING GEAR STRUTS.

THESE RECOMMENDED CONFIGURATIONS ARE BASED ON JSHIP ANALYSIS. THEY ARE NOT DIRECTIVE IN NATURE.



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## H.6 AH/MH-6J SERIES HELICOPTERS

### H.6.1 Basic Capabilities and Characteristics

The AH/MH-6J Special Operations aircraft is a highly modified/militarized version of the commercial Boeing-McDonnell Douglas 500 series helicopter. The aircraft has a single Allison 250-C30 engine, a single 5-bladed main rotor with 2-bladed tail rotor, and oleo-dampened skid-type landing gear.

1. Crew.

A crew consists of 1 pilot and 1 copilot.

2. Shipboard Operations Capability.
    a. Rotor brake.
    b. Manual blade fold (2 minutes under optimum conditions).
    c. Gravity refueling.
    d. Skid landing gear.
    e. TACAN.
    f. UHF.
    g. No APU (battery start).
3. Mission.

The aircraft can be configured as a light attack (AH) or mission (MH) helicopter. In the light attack role, the aircraft can carry a variety of offensive weapons. The mission configuration (MH) is for the insertion/extraction of personnel and cargo.

4. Mission Equipment.
    a. External Stores System for mounting of offensive weapons (AH-6J).
    b. Forward Looking Infrared (FLIR).
    c. SABRE radio ground communications.
    d. External Personnel System (MH-6J).
    e. External Fast Rope System (MH-6J).
    f. Emergency Casualty Evacuation System (MH-6J).
5. SAR Capability.

None. The aircraft may carry a caving ladder.

6. Dimensions (see Figure H-22).
    a. Spread (rotors turning): 36'9”L / 27'4”W / 8'11”H.
    b. Folded: 22'7”L / 6'6”W / 8'11”H.
    c. Spot factor (LHA/LHD): 1.31 (spread); 0.54 (folded).
7. Weight.
    a. Empty (no fuel, no crew): 2,150 lbs.
    b. Operating (fuel, crew, ordnance): 3,950 lbs.
    c. Max Gross on deck: 3,950 lbs.

8. Fuel/Quantity.
   a. Primary fuel: JP-8.
   b. Alternate fuel: JP-5/JP-4.
   c. Max main tank: 62 gals/422 lbs.
   d. Max auxiliary internal: up to 63 gals/429 lbs.
   e. Max total: 125 gals/851 lbs.
9. Ordnance (AH only).
   a. 7.62 mm machine gun.
   b. 2.75” rocket launchers.
   c. HELLFIRE missile system.
   d. CADs for stores jettison system.
10. Internal Lift Capability.
    a. Cargo area: 44”H (approx.) / 4'4”W (approx.) / 30”D (approx.) / 40 cubic feet.
    b. Troop capacity: 2 troops (AH); 6 troops (MH).
    c. Litter capacity: none (AH); 1 litter (MH).
    d. Cargo weight:1,300 lbs (AH); 1,500 lbs (MH).
11. External Lift Capability.

None.

12. Comm/Nav Equipment.
    a. SATCOM.
    b. UHF.
    c. VHF (AM/FM).
    d. Have Quick/Have Quick II.
    e. SINCGARS.
    f. TACAN.
    g. GPS.
    h. LORAN C.

Figure H-22. AH/MH-6J Dimensions

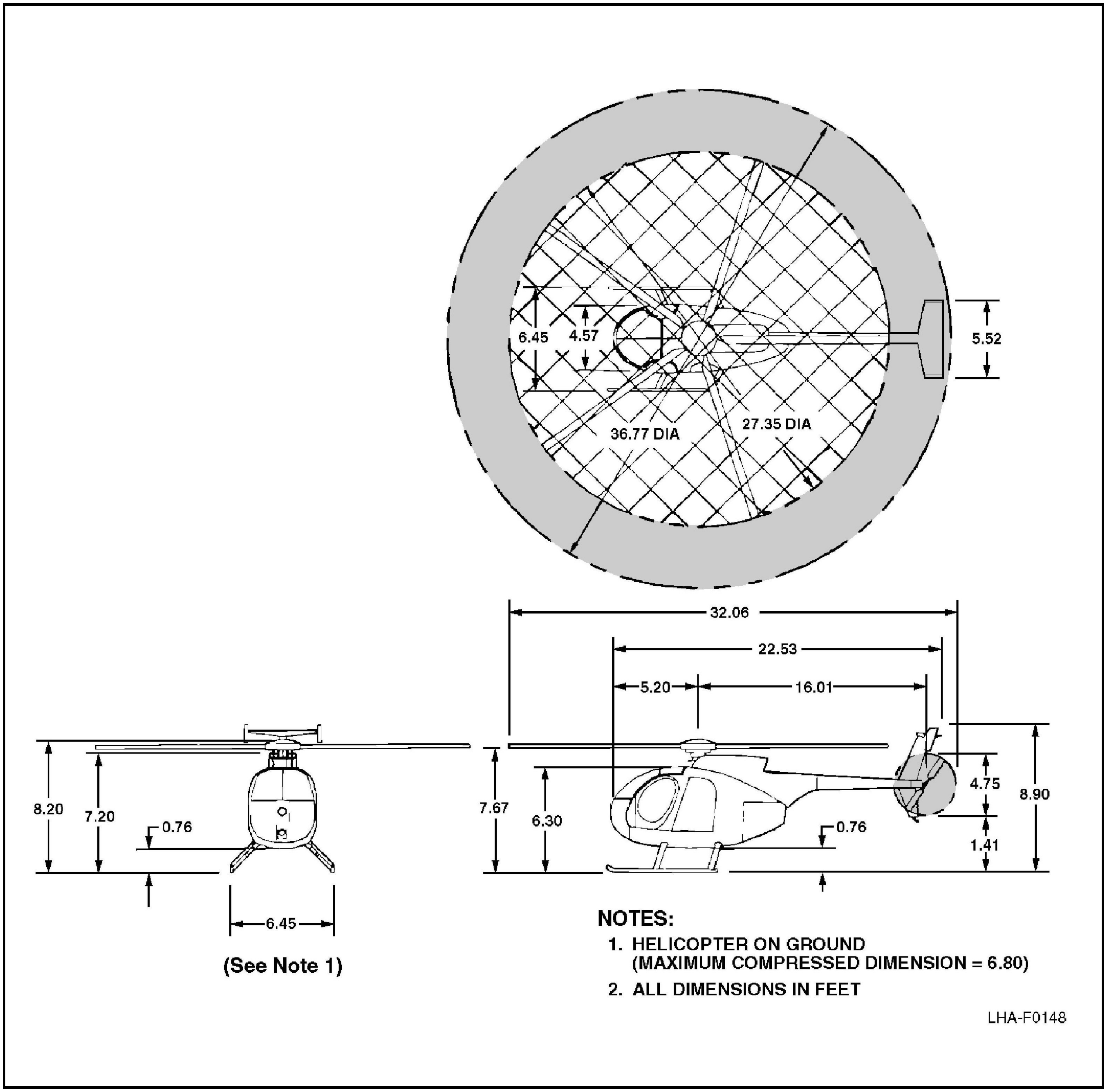
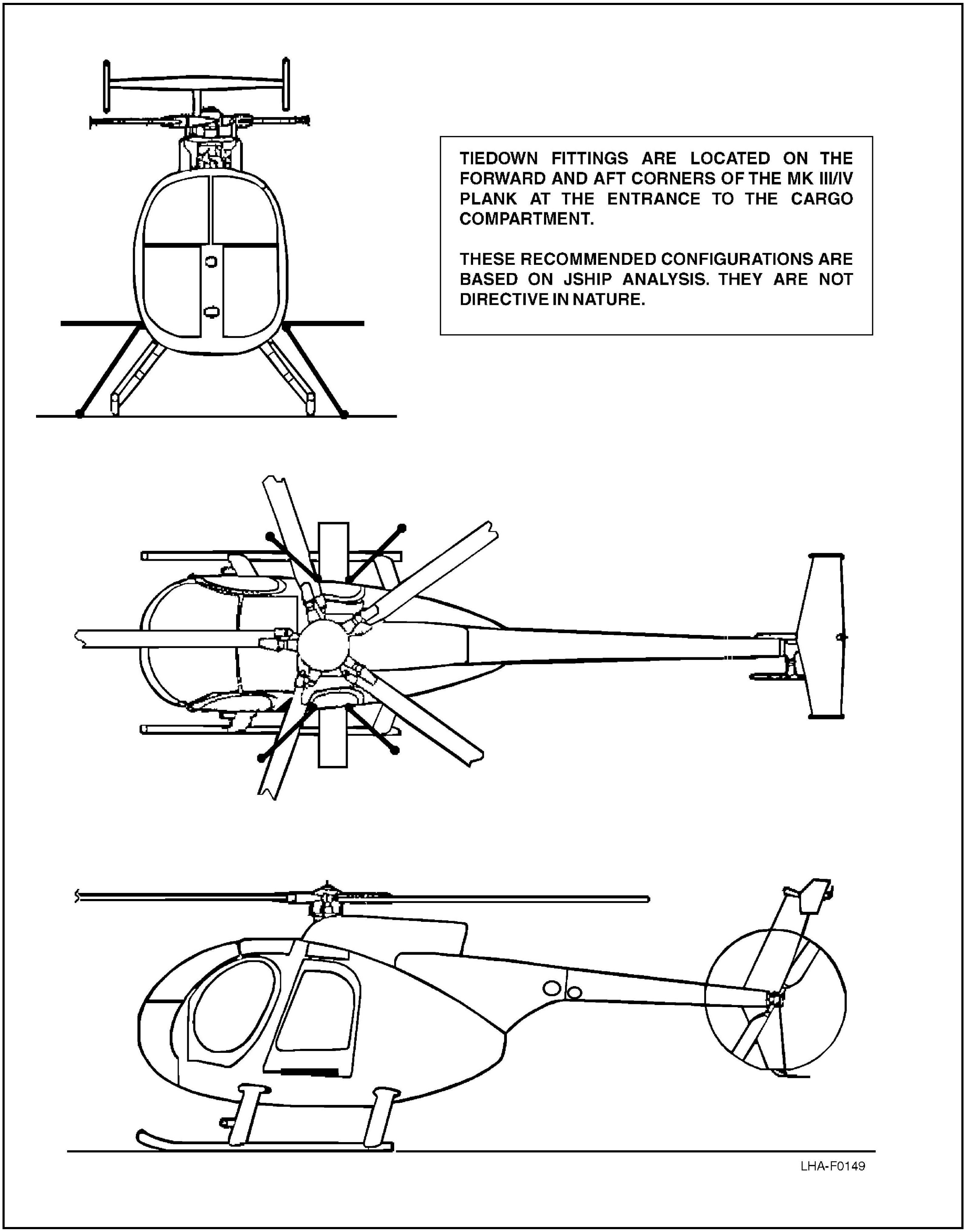


Figure H-23. AH/MH-6J Initial Tiedown Configurations (Recommended)



### H.6.2 AH/MH-6J Operational Considerations

#### H.6.2.1 Navigation to Ship

AH/MH-6J helicopters are equipped with TACAN.

#### H.6.2.2 Handling and Parking

The AH/MH-6J is skid-equipped and its towing point will not mate with the ALBAR or NT-4 towbar. Although an Army towbar exists, AH/MH-6J units routinely hand-push the aircraft as a matter of expediency.

**WARNING**

AH/MH-6J ground handling wheels do not have brakes. The aircraft should not be raised on its handling wheels until immediately prior to aircraft movement. Once raised, the aircraft should be treated as a wheeled aircraft without brakes. Braking of the aircraft by lowering it onto the skids cannot be accomplished immediately under all conditions. Chocks should be used on the ground handling wheels to the fullest possible extent during movement evolutions.

#### H.6.2.3 Refueling

AH/MH-6J helicopters are incapable of pressure refueling. Units are equipped with special gravity nozzles and adapters that can connect to the ship's D-1 single-point refuel nozzle. These special nozzles provide a better fit (diameter and angle) than the Navy overwing nozzle. Gravity refueling will require the shutdown of the aircraft's engine, resulting in a turnaround time of at least 6 minutes under optimum conditions.

#### H.6.2.4 Chaining

Certain AH/MH-6J ordnance/external stores configurations may partially or significantly restrict access to aircraft tiedown/mooring rings.

#### H.6.2.5 Blade Flapping Susceptibility

**CAUTION**

- Unlike Navy helicopters, Army H-6 helicopters are not equipped with an anti-flap device to limit excessive upward flapping of static main rotor blades. These helicopters are susceptible to static blade flapping, especially if blades are unrestrained and over the water in relative crosswinds that create strong updrafts at the ship's deck edge.

- The AH/MH-6J is an extremely lightweight helicopter and is very susceptible to rotor blade flapping and damage (more than Navy helicopters), even with the rotor blades folded. Every consideration should be given to minimizing the aircraft's exposure to high winds and rotor wash on the flight deck. Launches and recoveries to a spot immediately upwind or crosswind from an AH/MH-6J (blades unsecured, tied down, folded or rotating) should not be conducted except in case of an emergency.

### H.6.2.6 Electromagnetic Vulnerability

**WARNING**

Various shipboard transmitters can adversely affect non-Navy helicopters. When conducting joint shipboard helicopter operations, consideration must be given to potential radiation hazards, electromagnetic interference, and electronic vulnerability effects so that applicable transmitter conditions can be set prior to the non-Navy helicopter(s) arrival aboard the ship.

## APPENDIX I

# Hangar Bay Aircraft Move Brief Sheet

Figure I-1. Hangar Bay Aircraft Move Brief Sheet

**Hangar Bay Aircraft Move Brief Sheet**

Date:__________________

The aircraft move brief sheet shall be used prior to each aircraft move in the hangar bay. The aircraft director shall brief the entire move crew prior to hooking up to and moving the aircraft.

Aircraft:_______________________________________________________________

Move from: ____________________________________________________________

Move to: ______________________________________________________________

Reason for the move: ____________________________________________________

Entire move crew available: _______________________________________________

Ensure move crew has appropriate gear: ____________________________________

Gain permission to move the aircraft: ______________________________________

Conduct walkaround: ____________________________________________________

Hook up to the aircraft: _________________________________________________

Safely move into predetermined spot: _____________________________________

Secure the aircraft:_______________________________________________________

Call in status to Hangar deck control: ______________________________________

# APPENDIX J

# Crunch Report

Figure J-1. Crunch Report

(For use as required in Chapter 9.)

U.S.S. ______________________
Crunch Report No. _____________
Date ________________________
From: Flight Deck LCPO

ROUTING INSTRUCTIONS*
ORDER DATE OUT INITIAL

To: Commanding Officer
Via:
1. Aircraft Handling Officer (ACHO)
2. Ship's Safety Officer
3. Air Officer
4. Squadron/ACE CO
5. Squadron/ACE CO
6. Commander, MEU
7. Email report to:
   TYCOM COMNAVSURFPAC/COMNAVSURFLANT Code (N42)
   *EACH ADDEE SHALL ROUTE WITHIN 3 DAYS.

Subj: Aircraft Handling Mishap
1. Date/time of mishap
2. Location of mishap
3. Weather condition
4. Deck conditions
   a. Deck wet or dry
   b. Condition of non-skid
   c. Deck cleanliness
5. Description of mishap
6. Aircraft/equipment involved/damaged
7. Personnel involved (name, rate, service number, training qualifications):
   a. Director
   b. Plane Handlers
   c. Tractor Driver/Equipment Operator
   d. Plane Captain
   e. Pilot
   f. Other
8. Witnesses (name, rate, service number)
9. Causal Factors
10. Flight Deck LCPO Investigation/ Recommendations/Corrective Action:

COMMENTS AND RECOMMENDATIONS

11. ACHO
12. Ship's Safety Officer
13. Air Boss
14. Squadron/ACE CO,
15. Squadron/ACE CO,
16. Commander, MEU-
17. Ship's Commanding Officer

RETURN TO ACHO FOR FILING

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